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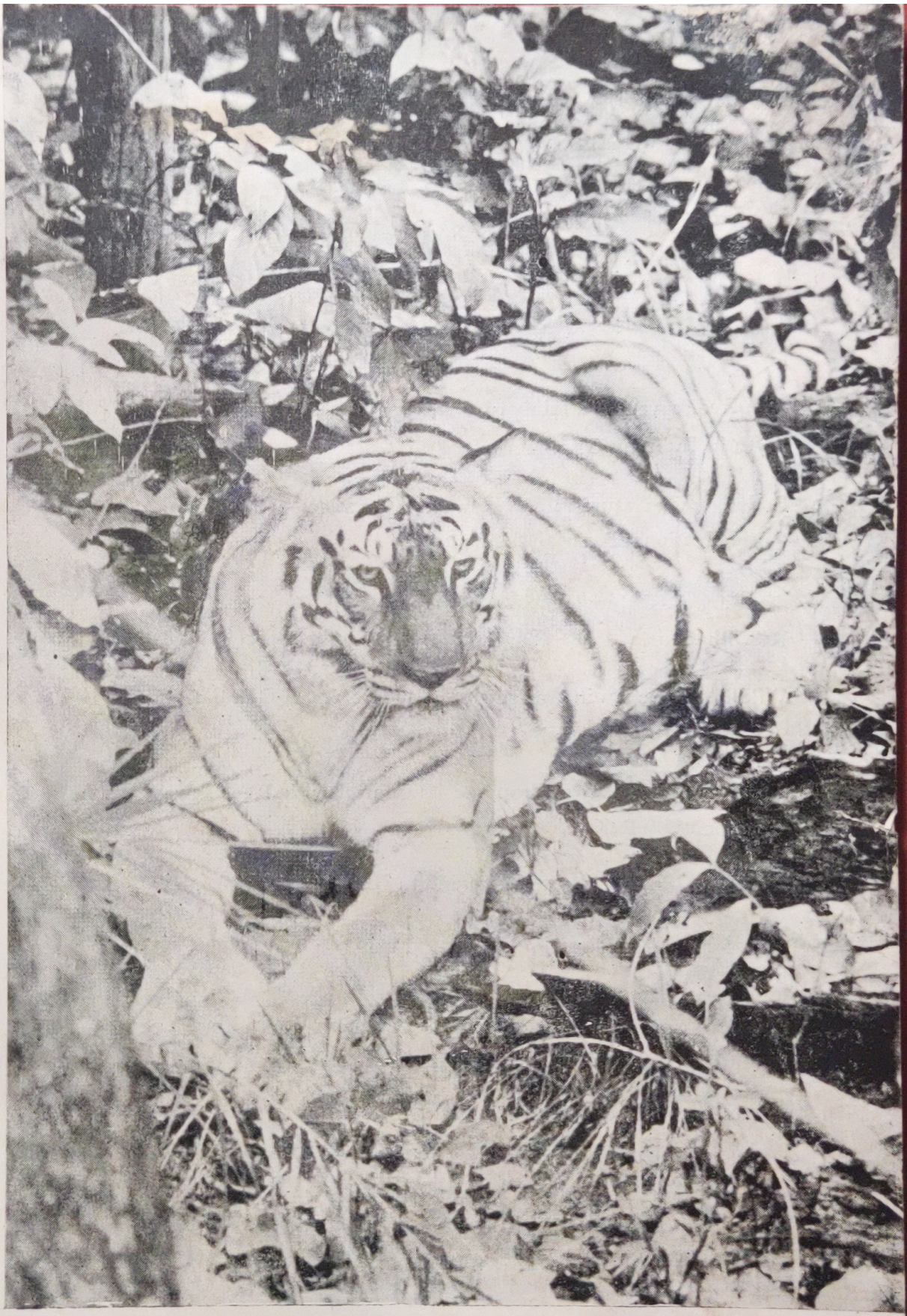

Photo—Ashish Chandola

The Wildlife Preservation Society of India

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The Rediscovery of Malabar Civet, *Viverra megaspila civettina* Blyth in India

By

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Malabar Civet, *Viverra megaspila civettina* Blyth, believed to have been near extinction has been rediscovered at a place about 60 km east of Calicut on the south west coast of India. Although first described more than 125 years ago *V. m. civettina* is not known to be represented by more than six specimens in museums, of which the last collected came from the Zoological Gardens at Trivandrum. Apparently all that is known about the animal is from the account given by Jerdon (1874, p. 122) who states that it is found throughout the Malabar coast from the latitude of Honore (Honnavar, N. Kanara district, Karnataka) at all events to Cape Camorin, and very possibly it extends further north, and that it inhabits the forests and richly wooded low land chiefly, but is occasionally found on the elevated forest tracts of Wynaad, Coorg etc. Lindsay (1928) and Pocock (1939) reviewed its taxonomic position, the latter placing it in a separate genus, *Moscothera* along with *megaspila* which is disjunctively distributed in far flung Burma and southeast Asia. However currently *Moscothera* is at best considered to be a subgenus of Viverra (Ellerman and Morrisson Scott

1951), and *civettina* is considered to be a subspecies of *megaspila* (Ellerman and Morrison Scott 1951; Honacki, *et al.* 1982).

Apparently the species declined drastically since Jerdon's times. The type specimen, originally in the collections of Indian Museum, Calcutta (now belonging to Zoological Survey of India (Z.S.I.) was collected in the year 1845 by Lord A. Hay of the Asiatic Society of Bengal and the three other specimens of the collections, one of which was collected and the other purchased, were all obtained before 1891 as catalogued by Sclatter (1891). There is no indication as to when the specimen from Trivandrum Zoo discribed by Pocock (1939) as the only one available to him for description was procured but persumably it must have been a few years before 1939. Probably it is the only specimen in the collections of Bombay Natural History Society on the basis of Lindsay in 1928 opined it to be of specific status. This means that *civettina* has not been collected at least for the last 59 years since 1928 and possibly for much longer time.

There have been only two unconfirmed reports of sighting of this animal in recent times, both during the previous decade; one by the present author himself who had a glimpse of the animal at a place called Thiruvalla in central Travancore in Kerala state and the other reported by Karanth (1985) in south Karnataka forests. The animal had eluded a number of surveys, notably those by the Zoological Society of London, during the first decade of this century and then by the Mammal Survey of 1920's initiated by the British Museum of Natural History that covered the south Asian countries falling within the then British Empire.

The species had therefore become very rare even by the turn of this century so much so that A.P. Kinloch who listed the mammals of the Nelliampathy hills (a segment of the Western Ghats) omitted this species from the list commenting that (what presumably is) this animal might exist there as judged from droppings but was never seen (Pocock 1939).

The rediscovery:

The Western Ghat Regional Station of the Zoological Survey of India at Calicut had been on the look out for this species for sometime now. Recently these efforts were stepped

up by the Zoological Survey at the instance of the Viverrid and Mustelid Specialist Group of the International Union for Conservation of Nature (I.U.C.N.). While reports of its likely occurrence from certain parts of Calicut and Wayanad districts were being verified by the Survey, reports of the capture of an uncommon animal at a place called Elayur *ca* 60 km east of Calicut were received. An investigating team led by this author reached the place. Unfortunately, the three specimens that were captured, had died a little while before that. However, the identification of the animals caught was confirmed as the Malabar civet from the skin of a dead specimen which is under further processing and preservation by the Zoological Survey. It will now be incorporated into the National Zoological collections also designated as the standard Zoological collection of India, containing over a million identified specimens from all animal groups from protozoa to mammals, easily the premier zoological collection in south east Asia, maintained by the Zoological Survey of India.

Malabar civet is a medium sized carnivore somewhat similar to the more common Small Indian civet (*Viverricula indica indica*) and the Toddy-cat (*Paradoxurus hermaphroditus*) but differs from them mainly in being much bigger, about the size of a dog, in having a crest of hairs along the back and in its bushy tail ringed by five incomplete white bands. It is usually found among bushes and thickets in richly wooded lands (rarely in trees) hiding during day time, and in night, seeking its food consisting largely of rats, shrews, poultry when available, and also fruits like berries.

This is third in a series of rediscovery in south India of animals believed to have been nearly extinct. First was the rediscovery of the southern population of the Madras Tree shrew (*Anathana ellioti ellioti*) by the author along with Hanna Chorazyna of Brain Research Institute, Brussels, (Chorazyna & Kurup 1975), the second being that of Jerdon's Courser near Cuddapaha by workers of Bombay Natural History Society (I.U.C.N. Bulletin April-June 1986). The Zoological Survey now proposes to undertake a status survey for the species all along the Western Ghats and also detailed ecological investigations at the site of its rediscovery.

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Endangered Nature and Nature Conservation

The fauna outside National Parks and Sanctuaries

Till as late as the nineteenth century human settlements were but islands amongst areas that were in a state of nature. In the first half of the present millennium with the inexorable rise in population and the conversion of ecosystem people into biosphere people (Dasmann, 1975), from those who derived sustenance from individual ecosystems to those who depended upon the resources of the globe—there was almost a *volta face*. The nature areas, especially the forests, became islands in a sea of humanity. In the second half of the 20th century these islands shrunk and are shrinking, to the effectively protected national parks and sanctuaries. In South Asia these islands, predictably, are miniscule. Yet if present trends continue—and there seems to be no significant signs of change—let alone wild animals and birds but nature itself will perhaps only survive in these parks and sanctuaries.

The population of Asia excluding the USSR, has risen from approximately 1887 million in 1950 to about 4000 million by 1975, and is expected to reach 6350 million by 2000 A.D. The major increase, of course, is in South Asia, where the population is rising at the ratio of 2·1 in relation to economic growth, and the majority of the rural people are even today living below the subsistence level. India has ever 180 million cattle and 60 million buffaloes, more than any country in the world. Can nations in the face of such circumstances restrict excessive exploitative practices and set aside more areas of arable land, man's most precious possession, for effective conservation ? What future is there for the fauna outside the national parks and sanctuaries ? Can even these 'islands' are as survive and save on a long term basis a majority of the species of plant and animal life that they purport to protect ?

Today in this region only Bhutan has over 10 percent of its land under national parks and sanctuaries. In most cases including India, Indonesia, Burma, Pakistan and Afghanistan, the percentage is below 2 percent. Sri Lanka has about 9.3 per cent of her area under the protected areas system but not all under the national parks and sanctuaries. The average size of 41 of a total of 54 such protected areas is less than 50 Sq. Km each, and many are just one Sq. Km. Can they fulfil the purpose for which they were created ?

The status and distribution of the tiger in India provides an interesting example and a portent of future trends. Of the 1827 tigers enumerated in 1972, 268 were in the 9 Tiger Reserves set up initially. By 1977 the number of tigers in these 9 had more than doubled to 612, while the total population in the whole country was estimated to have increased to 2484.

Hence, while the increase in the 9 reserves was 344, that in the rest of the country was 313, which also was almost entirely in the other national parks and sanctuaries including the 2 Tiger Reserves subsequently created. By 1979 the tiger population in these 9 original Reserves was reaching or had crossed the optimum holding capacity, and had risen to 658. In the meanwhile the count for the whole country had increased to 3015. This increase also has very largely been in the national parks and sanctuaries other than the tiger Reserves mentioned and which altogether, still comprise less than 3% of the total area of the country. The remainder were mainly those tigers who had moved out of the parks and sanctuaries with the filling up of the niches and territories therein. What are their prospects ? With the increased enforcement of the Wildlife (Protection) Act, 1972, and the cost of motor oil being what it is, 'White-Collar' poaching has certainly reduced very considerably. But habitat destruction is still going apace, the incidence of grazing has increased, and the wild ungulate populations are not increasing in most parts outside the parks and sanctuaries. So what are the options before a sub-adult tiger, especially a male, seeking his own home range ? Either he remains within his natal area in an already crowded park or sanctuary and run the risk of intraspecific aggression, the increased incidence of which is already coming to notice, or throw his lot with the area outside and subsist on livestock. It takes but one 'successful' poison consumption to do the trick for a troublesome tiger.

The case of the elephant is but a variation of this 'cat in the manger' syndrome. Large ranges are a pre-requisite for their survival. Not only are these being increasingly denied, but edible crops are being grown at their doorstep, resulting in man-animal conflict which does good neither to the elephant nor the conservation movement. Elephant numbers in U.P. increased from 350 in 1967 to 500 in 1976, but their habitat decreased from 2,55,000 ha to 1,74,000 ha during the same period (V.B. Singh, 1978). Instances of poisoning of elephants and poaching for ivory are on the increase in the country. Studies in South India have shown how habitat fragmentation is decimating the elephant (Nair and Gadgil, 1980) The large majority of the elephant population on the mainland of the Indian subcontinent, estimated at between 11 and 13 thousand by the Asian Elephant Specialist Group of the IUCN (1978), is outside of parks and sanctuaries, especially in the north-east. Those that are within these protected areas, need to move out periodically, and of all the wild mammalian species in South Asia the elephant is the most adversely affected by the insularization of protected areas.

Hangul (*Cervus elaphus hanglu*) is another animal which seasonally moves out of protected areas and whose predicament is far graver. From their winter quarters in the Dachigam sanctuary they move to the neighbouring Sindh and Lidder valleys in spring, some going as far as Maru-Wardhwan and upper Kishtwar which also has a resident population. The total number in all likelihood is less than 200, and there is hardly an animal which hash-

overed on the brick of extinction so long, mainly because it is unsafe outside the sanctuaries. Their main summer abodes need the protection of newly established sanctuaries as it may not be feasible to extend the existing ones to cover the annual range of the animal. Before that, studies need to be made to determine the extent of the summer ranges. The long awaited montane national park is upper Kishtwar would be a great asset. Special protective staff need to be stationed at strategic points to cover the migration route in September, when the stags return to Dachigam for the autumn, giving away their presence by their unmistakable roars.

Unheralded and often unheard of, the mammals of the Himalaya and trans-Himalaya have suffered a greater decline than the peninsular fauna in the last 3 decades. This is primarily because of the lack of adequate number of viable and effectively protected parks and sanctuaries. Indeed, this has been the single greatest failure of the conservation movement in India in the matter of establishment of protected areas. The remoteness, the lack of staff, the presence of graziers who depend upon the pasture, the harsh climate and the feeling, often not expressed but latent, that there is nothing really to protect there, have all contributed towards this predicament. The result is that of all the endangered mammals listed under schedule I of the Indian Wildlife (Protection) Act whose main populations today are outside parks and sanctuaries, the montane ones are the most.

Notable amongst them, are the Shapu (*Ovis Vignei)*, Tibetan antelope (*Panthalops hodgsoni*) Wild yak (*Bas grunniens*) Tibetan gazellee (*Procapra picticaudata*), Mishmi Takin (*Budorcas taxicolor*), pallas cat (*Felis manul*), lynx (*Felis lynx isabellinus*) snow leopard (Panthera uncia) Ovis Ammon (*ovis ammon hodgsoni*) musk deer (Moschus *moschiferus*) markhor (*Capra falconeri*) and the Red Panda (*Ailurus fulgens*). With the exception of the snow leopard, lynx, musk deer and the red panda, the other species are not protected in a single effective park or sanctuary. The reduction in the number of wild ungulates from what I saw in 1958 to those met with in 1970 in Ladakh, was startling. I barely saw any bharal (*Psedois nayaur*) on the second trip; in 1958 they were almost ubiquitous. The shapu, the yak, Ammon, Tibetan gazelle and the takin are on the verge of extinction in India, the others under serious threat.

Nepal has done better with the establishment of Sagarmatha, Langtang and Lake Rara National Parks, and the Shey sanctuary. Pakistan has created the Khunjerab National Park to protect with the other mountain fauna the incomparable Marco Polo sheep (*Ovis poli*). The greatest hope for Himalyan fauna, however, is in Bhutan, where the Jigme Dorji, Laya and Gasa sanctuaries cover the entire northern portion of the country.

Consider the other larger mammals whose major populations are outside parks and sanctuaries. The largest number are from the northest of the Indian subcontinent. The

golden langur (*Presbytus geei*), the pigmy hog (*sus salvanius*) and the hispid hare (*Caprolagus hispidius*) are found in only one safe area—the Manas and the contiguous Bhutan Manas. With the rapid reduction of the sub-montane high grasslands and the regular burnings of the remnant ones, the cryptic and secretive hare and the hog may easily fade into oblivion and hardly anyone the wiser. It is doubtful whether Manas alone can save them. Almost nothing is known of the present status and distribution of the gold cat (*Felis temmincki*) and that arboreal phantom of the forest, the clouded leopard (*Neofelis nebulosa*). They may occur in Chitwan and one or more sanctuaries in India, and they may not. Both are gravely endangered. With protection now being accorded viable remnant populations of the golden langur and of the lion-tailed macaque (*Macaca silenus*) in some sanctuaries, the hoolock gibbon (*Hylobates hoolock*) which is not so fortunate, is perhaps the most threatened primate in India now. Again little is known of its status.

In south India, though the major populations of the Nilgiri tahr (*Hemitragus hylocrius*) are in parks and sanctuaries, sizeable populations exist outside, notably in the Anamallais and the Highway Mountains where the tahr, having been completely closed to hunting now, have lost their greatest guardians—the sport-loving tea and coffee planters Nothing is known of the Malabar civet (*Viverrina megaspila*). It is not reported from any park or sanctuary.

Of the Caracal (*Felis carecal*) also almost next to nothing is known. The surviving populations would be in areas outside parks and sanctuaries—Kutch, Western Madhya Pradesh and eastern and southern Rajasthan. With the destruction of habitat and of the prey, their survival is in jeopardy. Of the other smaller cats—the marbled cat (*Felis marmorata*) and the rusty spotted cat (*Felis bengalensis*), very little is known of their numbers and distribution and the major surviving populations live outside of parks and sanctuaries.

The same also held true till very recently with the three Crocodilians found in the Indian subcontinent and the gharial then was amongst the most endangered animals in this part of the world. With captive breeding and the creation of a number of reserves, the position is happily very greatly improved. However, as in the case of other carnivores, the crocodiles moving out of sanctuaries and those released from captivity will come in conflict with man. With intensive fishing with nylon nets and destruction of nests, their numbers outside the protected areas can only increase substantially with regular captive breeding, which has had a very good beginning in India. The status of the other great reptile, the python (*Python molarus*), is causing concern. With habitat destruction, reduction of natural prey, exploitation for the sake of skins and no godfather to clamour for their interests, their position outside the protected areas is not secure.

One of the largest rookeries of marine turtle in the subcontinent has now been given the protection of a sanctuary on the Orissa coast. Elsewhere their nesting ground are not

secure, but the status of marine turtles in the Indian Ocean is far better than that of the fresh water turtles, terrapins and of the tortoises. The once common star tortoise exploited for the pet trade and harmed perhaps by pesticide spraying and certainly by habitat destruction, is now rare. The Travancore tortoise (Geochalone travencoria), endemic to eastern Kerala and Coorg (The IUCN, 1982) is now declining in numbers. The even more restricted Kavalai forest turtle (Heosemys silvatica) the last specimen of which had been collected in 1911 in the Cochin forests of Kerala, has been rediscovered in the same locality. Extremely circumscribed in distribution, it urgently needs protection, its habitat not being in a park or sanctuary.

The position of some of the larger mammals whose populations are mainly outside the protected areas, is safer. Of the 22,500 to 24,500 blackbucks (*Antilope—Cervicapra*) estimated to survive in India at present, approximately 12,000 live inside the parks and sanctuaries and the rest without. (Ranjitsinh, 1982). They have survived because of the religious zeal and sentiments of the local people, the Bishnois, the Wala Kathis, the vala Rajput and others, and their main concentrations—Velavadar, Doli and Tal Chapar—were protected by these people long before they became sanctuaries. Even now sizeable population live by the courtesy of religious sentiment Sathin, Khejarli, Lohawat and Guda Bishnoi in Jodhpur district. Vetnoi and Purshottampur in Orissa, Botad in Saurashtra. The Chinkara (*Gazella bennetti*) severely reduced and threatened also lives mainly outside of parks and sanctuaries and due almost entirely to religious sentiment and the remoteness of their remaining habitats. The largest concentration that survives today which I estimated at over 2000 in 1974, is in the area around Jamboji, the main shrine of the Bishnois in Western Rajasthan. The plains wolf (*Gamis lupus pallipes*) too is found almost entirely outside parks and sanctuaries. Severely reduced, this resourceful animal now very largely dependent upon livestock for its survival, is making a slow comeback in a number of areas and is reappearing in areas where it had disappeared in the recent past.

With the exception of Rane Bonnur in Karnataka, Karera and Ghatigoan in Madhya Pradesh and the newly created Desert National Park in Rajasthan, the large majority of the world population of the great Indian bustard (*Choriotis nigriceps*) numbering 650 to 630 birds (Rahmani, et al, 1983) lives outside of parks and sanctuaries. The largest single concentration in a small area that is known of, Shakaliya in Ajmer district, is not a sanctuary, but is presently safe with favourable opinion and support of the local people. Elsewhere where it has survived because of the remotness of their habitat and the non-hunting habits of the local people, their numbers seem to have established at the low level. The bird, however, continues to be threatened by hunting, habitat destruction and disturbances and the difficulties that its seasonal movements creates towards the setting up of effective protected areas.

Equally endangered by habitat destruction is the Bengal florican (*Houbaropsis bengalensis*). Though its range in the subcontinent extends from the Uttar Pradesh Terai to eastern Assam, it is now largely confined to the few scattered parks and sanctuaries in these alluvial grass-lands. Unless shortgrass areas, large enough to meet with their needs and adequate protection to safeguard this very localised bird are provided, it will vanish outside the protected areas, a situation which seems most likely under the present circumstances. But perhaps the most threatened of the 21 species of the endangered bustard family of the world and also its smallest member, is the exquisitely handsome lesser florican (*Sypheotides indica*). Endemic to the drier parts of western India, its habitats other than for the monsoon breeding period are unknown. This bird too occurs entirely outside parks and sanctuaries other than four sanctuaries in Madhya Pradesh, two of them just recently created. Shot and plagued by habitat modification, the bird is appearing in their breeding grounds in decreasing numbers, even in their former strongholds in Malwa, Kutch and Saurashtra. In Wankaner in Saurashtra despite the excellent rains this year, four were found in areas which traditionally should have harboured at least 20. It is possible that adverse factors are also affecting their non-monsoon grounds.

Habitat destruction has also affected the resident white-winged wood duck (*Cairina scutulata*) in India, Bangladesh as well as in South-east Asia. Their refuge are perennial streams lined with large shady trees, flowing for some length in disturbance-free forest areas, a tall order these days. There are no existing parks or sanctuaries in their habitats and the bird is still left to the mercy of the local people.

The most endangered member of that other threatened group, the tragopan pheasants, is Blyth's Tragopan (*Tragopan-blythi*) with its varication *t.b. molesworthi.* Endemic to Nagaland, Manipur and the adjacent areas of Burma, there is no safe heaven for them in those lands of inveterate hunters and shifting cultivation. In the western Himalaya, the status of the endangered cheer pheasant (*Catreus wallichi*) and of the western tragopan (*Tragopan melanocephalus*) is not precisely known, but the populations do not appear to be increasing.

The oceanic islands present a different dilemma. The remoteness, the relative lack of demographic pressures in some, the impression of idylic unspoilt paradises, inculcate a feeling of security and of lethargy. In 1973 after an extensive tour I had submitted a report recommending protected areas. Till now none have been set up. The Narchondam hornbill (*Phiteceros narcondami*) endemic only to this volcanic island, is safe today because of the terrain and its remoteness. But that is no reason why no sanctuary should be established. Will not lumber felling commence someday otherwise ?

Two birds which may soon become the most threatened with extinction in this part of the world, are the Andaman teal (*Anas andamanensis*) and the Nicobar megapode (*Megapodius*

freycinet), the only member of this mound nesting family west of the Wallace Line. The Andaman teal inhabits fresh water lakes, which are both few and the first to receive human settlements on their shores. I only saw one flock on a small lake on the little Andaman island in 1973. Some of the lakes like this and the one on Neil Island need to have sanctuaries established. Unlike the white winged wood duck, the Andaman teal has not bred in caativity in the Slimbridge Wildfowl Trust. The megaoode, whibh builds its conspicuous, large mounds in the lowland areas of the main Nicobar Islands, would have to deal with human settlements in their habitats and it is doubtful whether man or their dogs will spare the nests.

A sanctuary needs also to be established in the Grear Rann of Kutch, where the largest breeding colony of the greater and lesser flomingoes (*Pheeni capteridae*) in Asia, occurs. Policans also breed there. The same argument which till now has provented the establishment of a protected area there the place is already safe; who goes there—was also trotted out when I was trying to persuade the Gujarat Government to set up a sanctuary in the Little Rann for the wild ast (*Eguus hemionus khur*) ten year ago. But nothing can be presumed safe, not in South Asia nost of all. If conservation does not go to an area, something wlse will-someday. Besider, with the finding of substantial numbers of the wild ass in the Great Rann for the first time during the ensumeration this year, and the lesson from the anti locust pesticide spraying which washes down into the salt pan and must destroy the crustaceans and other food chain of the flamingoes, should be an incentive to the setting up a sanctuary in the Great Rann.

With the failure on the mountain front, the second non-performence of the cors ervation effort in India is in the way of marin protected areas. Protective efforts have been made in the coral:ric Pirotan island off the Jamnagar coast in Saurashtra. But no where has a marine part come up, not even to protect the magnificient coral beds of krusadei and Shingle islands off the Rameshwaram coast. The corals, the fish fauna and the dugong (*Dugong dugon*) continue to be exploited all along the Indian coast and around the Laccadives.

Lest all the above give the impression of failure on the part of the decision makers in India and read like a catalogue of candidates for extinction, it must be stated in all fairness that conservation had made a greater headway in this country than any other in sothern Asia. In some cases the State Governments councerned have already brought the entire or major portions of the habitats of remnant populations of endangered fauna under parks and sanctuaries, and it is very difficult to obtain others. In Madhya Pradesh over 12% of its forest area and 5% of the total area is covered under these two categories of protected areas.

Taere is, however, in some quarters a sense of enphoria, of having settled issues for all time to come when in reality only time has been bought. There is often a reluctance to set up new sanctuaries and parks when experience is proving over and yet over again that fauna and its habitate have a long term assured future, with but a few exceptions, in these areas alone. There is even a feeling that the areas already notified are enough. I think it should be evident to all that nature reserves that are created in the current decade may well be the last to be created in India.

The approach, however, must be different. The ploy in the past has been to get areas for the animals. The strategy henceforih should be to get the areas with the animals, eco-systems and watersheds for the sake of man.

Studies is island biogeography and in colonisation, extinction and survival of species therein, have revealed some very dramatic evidence. With nature reserves increasingly becoming insular islands with the modification of the surrounding areas, this data could well be of relevance. If the majority of the habitat is destroyed and a fraction of the area is saved as a reserve, the reserve will initially contain more spccies that it can hold at equilibrium. The excess will gradually become extinct. It only 10% of the area occupied as a habitat is saved as a reserve in a continuous and composite from, approximately half the original number of species found in the preserved habitat may survive in it. The smaller and more isolated the reserve, the higher the rate of extinction (Diamond, 1975). The highest extinction percentage will be species whose initial population were of fewer individuals either because the species is a carnivore, or because it has specialized habitat requirements, or because it is a large animal (Brown, 1971).

The above statement are of relevance to those reserves which still have a 'buffer'. It would wise to add wherever possible such buffers to the national park and enlarge them. Where such a step is not possible, the buffers around national parks should be notified as sanctuaries. A 'buffer' otherwise has no legal relevance anyway.

But there will always remain large habitat areas outside of parks and sanctuaries. What must be the approach there ? Game farming is a suggestion often put forth. It has not been a form of landuse that has had an auspicious beginning on this subcontinent, for reasons obvious to all. But that does not imply that it has no potential whatsoever. Evin if African proto-types may be difficult to establish in this region, there are other approaches. To cite but some examples, the harvesting of marine turtle eggs, if scientifically implemented, would be certainly feasible and could become a very valuable protein diet resources. The fur export of Kashmir alone is valued at some 60 million rupees annually (Mir Inayat ullah, pers, comm.) In the Reserve and Protected forests a more appropriate landuse practice would

haxe to be adopted if these forests and rangeland are to remain productive and able to contribute to the national economy. Overgrazing and over-exploitation would have to be stopped. The managers of these lands must also alter their priorities and attituded. Their pride and job satisfaction must emanate from what they have been able to save and to raise in the way of forest wealth, not what they have been able to raise at the annual auctions. If the landuse is improved, the fauna will survive and perhaps even thrive. If not, then we shall have barren hills and a sterile land and far, far more than the fauna would have been lost.

As would be evident, the so called 'buffer' zones and habitats around the parks and sanctuaries would not constitute as a class the potentially most imqortant cors ervation units outside of the protected areas. It would be into these areas that the excess carnivore and even harbivore would have into. These would be the areas, if adequately safeguarded, that would prevent the biological and ecological isolation of the parks and sanctuaries, and in the case this does happen, provide at least 'land bridges' to other habitats. Here the involvement and support of the local people would play a most crucial role. These are the major areas of 'conflict' with the local people, and thep highlight most of all the third and the greatest failure of the conservation effort in India—the failure to obtain widespread popular support to conservation, especially of the rural peoples most affected.

This albeit, is very difficult. But has a serious attempt been made on a wide scale ? The approach of the park managar is often of 'us' versus 'they'—the insiders versus the outsiders. There are reasons for such on approach, some of them valid. But will such a policy pay lasting dividends ? As Northern Myors (1982) says, all forms of land use and especially their administrators, need to maintain cordial relations with their heighbours; if neighbours are treated as enemies they may start to behave as enemies. The manager may well find it worthwhile to spend more time in dealing with the lands and peoples outside his boundary, than in 'developing' his charge. In the words of Aldo Leopold "Development is a job not of building roads into lovely country, but of building receptivity into the still unlovely human mind."

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Breeding Red Junglefowl *(Gallus gallus)* In Captivity

By

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Red Junglefowl, most saught after bird in the forest for the pot, declined in number in many areas and even wiped out completely from others, due to over shooting, large scale mechanised plantations, intensive logging activities and destruction of their habitat. But the promulgation of Wild Life (Protection) Act 1972 followed by schemes like intensive management of wildlife inside and outside National Parks and Sanctuaries, creation of new parks and sanctuaries, captive breeding and rehabilitation of endangered species and launching of Project Tiger programme, brought a new ray of hope for the vanishing wild fauna. Under the frame work of this Act and National Wild Life Action Plan, not only the losses caused to the Wild Life and its habitat are being retrieved by preserving whatever is left, but also by breeding in captivity such species, which can be rehabilitated in wild in order to augment the remnant population and to preserve the gene-pool for future exigencies.

Breeding of Red Junglefowls in captivity is being attempted with this objective, in aviaries built in Kukrail forest near Lucknow. Six enclosures of 6 m × 3 m × 2 m size having Kachcha floor, covered, with wiremesh were built and a covered makeshift hide, made of bricks, was provided in one corner of each enclosure. In the year 1985, during second week of March, five pairs of red junglefowls were trapped with net in West Bahraich Forest Division and released in these enclosures.

On being released, the birds being wary, hid themselves in the hide, inside the enclosure and would hesitate to come out even for drinking water and picking feed, during day time. Hence feed and water had to be provided right at the opening of the hide. This behaviour was observed for about 3-4 days but soon after the birds started tolerating the particular keeper, who used to attend on them to provide feed and water. Strangers were still not tolerated. For about 3-4 months, I noticed that whenever I went to watch them from close quarters, the birds would run and fly in panic, hitting against wire mesh and finally rushing for the hide. Gradually they became tolerant and less wary to tolerate us.

Diet

Though in wild state, junglefowls feed on variety of wild seeds, insects and vegetable matter, but in captivity, the birds were given a regular diet of soaked Wheat (60%) mixed with paddy, Bajra, Urad, Kakun, Bran and spinach leaves, put together to make 40%. The quantity per bird was fixed at 100 g, per day, which was given in two shifts at 8 A.M. and 5 P.M. in a specially made feed pan (used for poultry). Besides this, grasses, bushes, bajra and paddy etc. were grown in the enclosures to simulate natural habitat and also to

make available insects etc. harbouring in that vegetation as part of their natural diet. Deworming was regularly done on the advice of our Zoo vet with Piperazine and castaphone.

Breeding

Since April-May is the usual breeding period for these birds in the Tarai forests, it was expected that, hens would lay eggs during April-May 1985, as all the birds captured looked fully grown up. To our surprise, only one hen laid a solitary egg, which was left in the care of the hen, but it did not hatch. Reason for this could be due to stress of capture, transport, and change in environment that the birds underwent just before the season and consequently laying was affected.

Nevertheless, we looked forward to the next breeding season with hope and promise but not to take chances, started preparing birds by toning up their health and vigour, which was thought necessary to compensate for their natural diet. Terramycin egg formula was given for about three weeks in Jan.-Feb. 1986, Supplevite—M preparation containing vitamins, was also mixed with feed in February-March 1986.

Egg Laying

Egg laying started since March 5, 1986 and continued till June 7, 1986. In all 4 hens, accompanied by cocks laid eggs. One hen, each in encl. No. 1 & 2 were kept and two hens. were kept together in encl. No. 3 along with cocks. The egg laying was observed daily in each enclosure until the last egg was laid and the pattern of laying which emerged is as under :—

Encl. No.	Date of laying	No. of eggs laid	Encl. No.	Date of laying	No. of eggs laid	Encl. No.	Date of laying	No. of eggs laid
1.	5.3.86	1	2	16.4.86	1	3	5.3.86	1
	7.3.86	1		17.4.86	1		7.3.86	1
	8.3.86	1		21.4.86	1		8.3.86	1
	11.3.86	1		22.4.86	1		11.3.86	1
	17.3.86	1		25.4.86	1		17.3.86	1
	18.4.86	1		29.4.86	1		4.9.86	1
	11.5.86	1		11.5.86	1		5.4.86	1
				13.5.86	1		15.4.86	1
							19.4.86	1
							23.4.86	1
							25.4 86	1
							12.5.86	1
							17.5 86	1
							21.5.86	1
							30.5.86	1
							7.6.86	1

From this data following conclusions can be drawn:—

(1) The no. of eggs laid by each hen is about 7 to 8. Thus in red junglefowls the female possesses about 8 ovarian follicles. (In enclosure No. 3, two hens laid 16 eggs.)

(2) Period of laying eggs, spreads over March through April & May. In some cases it may spill over to first week of June even.

(3) Laying period of one hen can be as long as nearly two months.

(4) Eggs are not laid on consecutive days, and interval keeps on increasing as laying proceeds further.

Egg-size

Out of these eggs ten eggs were taken randomly from all the clutches which were measured and weighed and following data was recorded:—

Sl. No.	Length (cm)	Mid dia. (cm)	Weight (g)
1.	4.63	3.38	25.0
2.	4.76	3.35	25.5
3.	4.57	3.43	24.3
4.	4.80	3.28	21.2
5.	4.42	3.25	22.2
6.	4.44	3.35	25.2
7.	4.55	3.53	27.3
8.	4.63	3.44	14.0 (Note)
9.	4.47	3.37	26.5
10.	4.22	3.17	25.0
Average	4.49	3.35	24.68
Standard deviation	0.182	0.102	1.927

Note:—

Egg No. 8 was unfertile egg, which did not hatch and this is why its weight was much less than others. While calculating average wt. and S.D. thereof, this egg has been excluded.

Hatching

In the beginning the eggs were left under the care of the hen concerned, but it was noticed during day time that the hens were only casually sitting over the eggs otherwise they were found wandering most of the time in the enclosure. During night perhaps they were sitting over the eggs. Fearing that eggs may not hatch due to careless behaviour of hens, I decided to place the eggs under broodies, but by that time earliest laid eggs were about 24 to 26 days old. The first hatching of two eggs occurred on 12.4.86. Under the broodies, the dates written on eggs got obliterated and therefore actual hatching time could not be ascertained. Under two broodies, only 15 eggs hatched and out of these only 8 chicks survived. The chicks were observed to come out of the egg shell from the pointed end side.

Now the birds have settled in captive conditions and success in laying has been achieved. In the next laying season, it will be investigated if egg laying in captivity can be increased by diet supplements and also the comparative success of incubation and its period under the mother hen and broodies will be studied.

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Wildlife Protection in Ancient India

(A study based on ancient Sanskrit Literature)

Dr. Vineet Ghildial—Sharma[1] and Dr. Ramesh C. Sharma[2]

India has a rich heritage of wildlife as well as a long history and tradition of the protection of a most sensitive and vulnerable element of natural life—animals. The ethic of wildlife protection was imbibed in the Sylvan surroundings of the *Ashramas* of our sages which were the seats of learning in the country's ancient past. The first recorded game laws were promulgated by Kautilya in his *Arthashastra* in the third century B.C., in which provision was made to punish severely all offenders if they entrapped, killed or molested deer, bison, bird or fish in an area declared 'protected'. The forests were called *Abhayaranya.* One-sixth of all wildlife, such as birds and beasts, was let off in forests under state protection. Certain animals and birds were absolutely protected.

Indian mythology is equally profuse with references to our regard and love for wild animals. In the *Purusha Sukta*, a prayer "*Shanno astu dwipade san chatuspade*" meant to invoke peace and happiness to all men and animals. Different animals were associated with different Gods and were thus provided with religious sanctity and ensured protection. In a hundred verses are echoed the prayers of the Vedic hymns praising the cattle. *Nandi* as the *Vahan* of Shiva and *Garuda* of Vishnu are objects of great veneration. The lion is the charger of Durga in her fight against the forces of darkness and barbarism. It is because of this association that lion has become the symbol of *dharma.* The king sat on *singhasana*, namely, the seat of lion, to dispense justice. Today, it is the lion's head that adorns the Ashoka's pillar which is the motif of the Republic of India.

Similarly, the swan is the *Vahan* of Saraswati. The Goddess Lakshmi is represented as being surrounded by elephants, while the elephant god, Ganesh, holds a positon higher than other gods in religious ceremonies. Hanuman, the ape-god, has been worshiped by millions of our people since ancient time.

Kalidas's hunted deer also flew to the *rishi's ashram* for protection (*Bho bho Rajan ! asram mragoyam na hantavyo no hatavyah*).

Ashoka's fifth pillar edict of the 3rd century B.C. gave protection to animals and forests. Emperor Ashoka defined a king's duty as not merely to protect citizens and punish wrong doers but also to protect animal life and forest trees. Ashoka had prohibited the catching of fish even from tanks and animals from forests on certain specified days.

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The ancient Sanskrit literature such as *Sutras* and *Smrti* which were written in the centuries immediately preceding Christ contain some laws intended to protect wildlife. Killing of birds and fish, even unintentionally, is to be atoned for by fasting and suitable penances. A killer or a stealer of animals is also required to pay a fine. Thus it says:

Paksighātī matsyaghātī ca dasa-kārsapānān

(Adhyāya V. Sūtra 53).

'A killer of birds or of fish shall pay 10 karsapanas'

Sutra-karpasa-gomaya-guda-dadhi-ksira-takra-trnu-lavana-mrd-bhasma-paksi matsya-ghrta-taila-mamsa-madhu-vaidala-venu-mrnmaya-lauha-bhandanam = apaharta mulyat ytrigunam dandyah (Adhyaya V. Sutra 83).

'A stealer of thread, cotton. cowdung, sugar, sour milk, milk, butter-milk, grass, salt, clay, ashes, birds, fish, clarified butter, oil, meat, honey, basket-work, canes of bamboo, earthenware or iron pots, shall pay three times their value as fine.

Godh-oluka-kaka-jhasa-vadho tri-ratram = upavaset |

(Adhyaya L, Sutra 32)

If a man has killed (unintentionally) an iguana, oran owl, or a crow, or a fish, he must fast for three days.

The *Manu Smrti* has also similar laws for the protection of wildlife. Animals are not to be stolen or killed unnecessarily:

Matsyanam paksinam c = aiva tailasya ca ghrtasya ca |
Mamsasya madhunas - c =aiva yac = c = anyat pasu-sambhavam | |

(Adhyaya VIII, 328)

'(For stealing fish, birds, oil, clarified butter, meat, honey and other things that come from beasts, the fine (shall be) twice the value of the stolen article)'.

Khar-asv-ostra-mrg-ebanam = aj-avika-vadhas = tada |
Samkarikaranam jneyam min-ahi-mahisasya ca | |

(Adhyaya XI, 69).

'Killing a donkey, a horse, a camel, a deer, an elephant, a goat, a sheep, a fish, a snake or a buffalo must be known to degrade (the offender) to a mixed caste'.

Evidently the catching of fish is to be the exclusive avocation of particular communities owing to the social stigma attached to the occupation. The *Manu Smrti* assigns this task to a particular mixed caste, the *Nisada*.

Matsya-ghato nisadanam
tvastis = tv = ayogarvasya ca |
med-andhra-cuncu-madgunam-
aranya-pasu-hinsanam | |

(Adhyaya X, 48).

'Killing fish to *Nisadas*, carpenter's work to *Ayogava*, to *Medas*, *Andhras*, *Cuncus* and *Madgus* the slaughter of wild animals.

Bird Damage in 'Bajra' Crop and Its Control with Repellent Treatments

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Introduction

Appreciations of significance and complexities of management of both, depredatory as well as problematic aves have so far been lacking in India. By and large conservationists have the notion that applied studies basically aim at population reduction of depredatory aves. Imperative need is to give a perusal to the concepts of avian managemenl (Bhatnagar, 1976-a, b; 1979, 1980, 1982-a, b). Due to multiplicity in economic and population status of most of the depredatory aves taken at country wide level, management approaches affecting life of aves viz., with lethally toxic substances or others that affect their breeding etc. is not advisable and is not resorted in management of aves in India. Othar safer approaches like bioacoustics, use of frightening substances or such devices etc. (Mehrotra & Bhatnagar, 1979) are still at developmental stages. Pending development of these, use of feeding repellents which affect feeding aversions leave obvious choice as due to aversions ingestion of chemical is least in aves. Studies on such chemicals have largely been wanting in India.

Review of literature on the aspect (Agarwal & Bhatnagar, 1982-a,b; Bhatnagar, 1976-a,b; 1979, 1981, asb & Mehrotra & Bhatnagar, 1979) shows that so far emphasis has largely been on screening of chemicals rather than for screening of repellency and the alterations of behaviour i.e, the feeding aversions leading to development of learned aversions. In context to Indian species, these aspects deserve attention as species affecting depredations are expected to learn to avoid the crops that have been treated with such repellents. This is affected with conditioning of 'feeding reflexes' (Roger, 1974). Use of such feeding repellents is thus expected to affect management of depredations rather than the management of depredatory avian species.

Keeping in view previously stated points, various studies on 'bajra' crop, The Pearl Millet with various treatments of methiocarb which is a known avian repellent were undertaken. Methodology followed comprised field trials conforming to recommended agronomical practices with certified seeds of known germination viability. These trials were conducted at the farms of Indian Agricultural Research Institute, New Delhi. In order to

avoid redundant coverage basic details on methodology etc. are not being dealt with and may be referred to Agarwal & Bhatnagar (1982-b).

Feeding aversions in Indian Ploceids

Bajra crop being most vulnerable at grain maturity offered obvious choice for investigations on 'feeding aversions' under methiocarb treatements in field conditions. Results of repeated field trials showed poor repellency under spray treatments in concentrations ranging from 0.25% to 1.0% of aqueous methiocarb sprays ltrs/h. These also indicated that single sprays have poor repellency as the data did not show significant statistical differences in yield output under various treatments. For further understanding of 'learned aversions' under field conditions, parameters were undertaken for correlations of index of visitants (frequency of damage) with availability of grains on earheads (per cent grain bearing earheads). Since direct counts of number of visitants (a factor indicating feeding aversions) is not practically feasible in any field trial, this was taken from indirect index. Analysis indicated, correlations between the parameters are poor and statistically differences are insignificant in various randomly treated plots. These appeared to further indicate that feeding aversions (taken from grain picking) under effects of 'locales' are poorly affected at these concentrationg of methiocarb treatments. However, 'stress' was noticeable for 3-4 days only. Single sprays of the repellent is insufficient to affect significant repellency under field conditions. Further for development of learned aversions with methiocarb sprays in bajra crop, considerably large area is required to be sprayed simultaneously. It is therefore suggested that futuristic studies should take into account these points for evaluations of these aspects in further details.

Depredatory species at sowing stage

In India, 48 species have been reported depredatory at sowing stage (Bhatnagar, 1980). Of these 12 species are partial to the crop. In northern India, main depredatory species are Blue Rock Pigeon, *Columba livia* (Gmelin) and Ringnecked Dove, *Streptopelia decaocto* (Frivald). These affect depredations immediately the freshly sown fields have been cleared off the 'human elements' which have the 'scaring effects' and checks settling off the flocks. Settling of flocks is more in fields sowing has been done by seed broadcasting. Flock density may be as high as 130 individuals acre. It has also been observed that generally beyond this number settling of flocks is not there. Feeding flocks of *Streptopelia* spp. generally do not associate in any manner with feeding flocks of Blue Rock Piegeons Depredatory activities usually commence little after sun-rise and may continue whole day if not scared excepting during the period day temperature is very high. Generally depredatory activity is pronounced at two peak periods: immediately after sunrise and from 16.00 hrs. till sun set. Depredations are affected till sprouting seed is present. At sprouting besides columbids, depredations are also at times affected by *Corvus* spp. which pull the sprouting seed and seedlings. Soft swollen seed is taken and the seedling is discarded.

Studies have also indicated that even changes in pattern of seed sowing does not reduce extent of depredations. Columbids are able to perceive the 'zigzac' sowing or varied seed to seed to distance. At times birds even move backwards or in half circles, continuously 'scratch' ground to pick out the sown seeds.

Extent of depredations at sowing stage

Studies in experimental plots have indicated that as high as 85.00% seed loss may be affected to sown seeds. Due to this, 8.83 to 12.75% area sowing has been done may be devoid of seeds. Another study (data in Table-1) showed that estimated seed loss due to birds ranged from 1.24 to 1.79 kgs/h and which on computations comes to 9.55% of the recommended seed rate per hectare. Further, increase of availability by decreasing seed to seed distance (done by sowing counted seeds by hand dibbling) to draw more infestations in the same area, indicated that per hectare, gaps may range from 1.06 sq. m to 17.00 sq. m However, if the sowing is done on recommended seed rate of 5.0 kgs/h, extent of losses would be obviously more.

Table 1

Bird damage at sowing stage in 'Bajra' variety BMH-24. Legend to column headings given below the table.

I.	II.	III.	IV.	V.	VI.
1.	22.67	0.1195	0.1133	1.5933	15.1066
2.	17.50	0.0922	0 0875	1.2293	11.6666
3.	25.50	0.1344	0.1275	1.7920	27.00
4.	17.67	0.0931	0.0908	1 2413	10.666

Data refers to 100 seed weight of 527 mg @ 30 seeds/mtr row or 158. 1 mg seeds/mtr i.e., at seed rate of 2.12 kg/h.

Legend to horizontal columns:- I., randomised plots; II., numbers seeds lost/mtr row; III., weight of seed lost in gms/mtr row; IV.; gaps in cm/mtr row due to bird damage; V., estimated seed loss in kg/h and VI., estimated gaps in Sq mtrs/h.

Control of depredations at sowing stage

Depredatory aves at sowing stage in many areas comprise both, protected aswell as species of dual economic status. Therefore management of depredations by aves can not be taken with approaches adversely affecting populations. Seed dressings with feeding repellent methiocarb (data in Table 2) although showed limited efficacy, yet appears promising for the present, especially as does not affect either any mortality or adversely affects any of the involved avian species. This is due to feeding aversions which in consequence affects least ingestion of chemicals.

Table 2

Efficacy of methiocarb seed dressings in controlling avian depred ations at sowing stage in 'bajra' variety BMH-24.

I.	II.	III.	IV.	V.	VI.
1.	1.581	17.42 (0.09)	1.19	22.90	29.41
2.	1.581	21.73 (0.115)	1.33	13.63	15.78
3.	0.527	19.14 (0.100)	1.40	9.27	10.00
4.	0.0	20.53	1.54	—	—

Legend to column headings:— Horizontal Columns:— I., Treatments as in vertical column 1 to 4; II., chemical in grammes (decimal point at '-03') applied per mtr row; III., average number of seeds lost with weight in parentheses; IV., Seeds lost in Kgs/h; V., per cent increase due to treatments; VI., per cent avoidable loss.

Vertical columns: 1.r to 4: Treatments:— 1., 0.75% methiocarb seed dressings; 2.; @ 0.2108 kg/h (0.01581 kg a. i./h); 2., 0.75% methiocarb seed dipping; 3., 0.25% methiocarb seed dressings; @ 0.0702 Kg/h (0.0052 Kg a. i./h) and 4., untreated.

Depredating species at grain maturity

Field studies have rave revealed that at grain maturity dominant depredatory species are ploceids and estrildinids. These start affecting depredations immediately at grain setting stage. Ploceids observed depredating the crop comprised Common Indian Sparrow, *Passer domesticus* (Linn.); Baya Weaver *Ploceus philippinus* ; Streaked Weaver, *Ploceus manvar.* Of these the later species is uncommonly seen in north India. Depredatory estrildinids comprised, *Estrilda bruniceps* ; Redheaded Awadavat, *Amandawa amandava* and Spotted Munia. Amongst psittacids, the species regularly recorded was Common Roseringed Parakeet, *Psittacula krameri* (Scopoli). Thesr were invariably observed when the grain setting was complete and besides feeding perched on the earheads also cut and carry away the earheads to roost. Studies on relative susceptibility of different varieties of bajra (being separately reported) have revealed many interesting points of usages in development of 'bird resistant bajra varieties'. These also revealed that ploceids do not depredate varieties having deep set grains. Various plant characters were observed to be affecting susceptibility, namely, deep set grains, earheads covered with shed layers of anthers and earheads with bristles especially those that cover more than 1 to 2.0 cm. Besides 'resident' or 'local' depredatory species, migrant *Sturnus vulgaris* (Linn.) have also been observed depredating the crop at grain maturity. Varietal characters like presence of bristles and shed layer of anthers affect little resistance against the species.

Extent of depredations at grain maturity

These studies have indicated that extent of depredations considerably vary. Estimated yield losses ranged from 6.35 R/h to 18.94 Q/h. Data is given in Table 3 which is self explainatory. It indicated that due to avian depredations 21.50 to 41.75% yield loss is affected by the depredatory aves. Estimates at country wide levels are not yet available but are envisaged (Raheja *et al.* (1979). Due to high losses in the crop, statement of Jotwani *et al.* (1969) that due to excessive damage, farmers in many areas prefer to cultivate the crop for fodder purposes only seems to hold good.

Table 3

Appraisal of avian depredations at grain maturity in 'bajra' variety BMH-24 (Legend to headings given below the table)

I	II	III	IV	V	VI
1.	214.00	209.25	214.75	193.25	185.00
2.	82.38	84.51 (86.43)	75.11	74.87	82.39
3.	17.61	15.48 (15.83)	21.90	25.12	17.60
4.	39.76	34.01	33.24	35.31	48.08
5.	41.30	49.75	40.68	39.55	34.31
6.	49.22	68.11	63.45	69.54	59.37
7.	27.88	8.63 (6.23)	16.31 (12.65)	12.50 (8.84)	19.00 (16.02)
8.	22.69	15.00 (10.84)	5.13 (3.98)	1.17 (7.20)	13.81 (11.65)
9.	10.39	26.01 (18.80)	16.73 (12.98)	24.27 (17.18)	12.55 (10.58)
10.	24.10	18.51 (13.38)	39.47 (30.62)	30.70 (21.47)	14.69 (12.38)
11.	27.39	39.34 (28.43)	24.91 (19.32)	38.81 (27.47)	32.04 (27.02)
12.	10.25	13.81 (0.98)	11.81 (9.16)	13.76 (9.74)	11.50 (9.69)
13.	35.68	48.74	31.72	29.56	30.20
14.	20.79	29.80	22.68	23.20	22.87
15.	14.89	18.94	9.04	6.35	7.32
16.	58.27	81.14	71.49	78.49	75.73
17.	41.72	38.85	28.50	21.50	24.26

Legend to horizontal columns: I., Serial numbers parameters for data items taken (as in vertical columns from 1 to 17); II to VI., Experimental replicated plots.

Legend to vertical columns: I., total average number earheads; 2., per cent grain bearing earheads; 3., per cent green earheads; 4 , per cent damaged earheads; 5., per cent undamaged earheads; 6., per cent randomised earheads examined for frequency of damage; 7., per cent undamaged earheads as in col. 5; 8., per cent earheads damaged in category-25%; 9. per cent earheads damaged in category-50%; 10., per cent earheads damaged in category-75%: 11., per cent earheads damaged in category-100%; 12., yield loss due to completely damaged earheads; 13., estimated yield in equintals/h from completely protected plots; 14., estimated yield from unprotected plots in equnitals/h; 15., estimated yield loss in q/h; 16., per cent yield obtained and 17., per cent yield loss due to bird damage.

Control of avian depredations at grain maturity

Pan tests on cage acclimatised Blue Rock Pigeons were undertaken with 'bajra' earheads treated with aq. sprays of methiocarb in concentrations ranging from 8 25% to 1.5%. These revealed that repellency is high and ranged up to 90.0%. In field conditions however, varied degree of repellency was observed. Analysis of the data showed that only 1.5% methiocarb sprays showed 2.3858% more yield than the untreated control plots. These treatments therefore proved ineffective. Succeeding studies (Bhatnagar, 1981-b) also indicated that methiocarb sprays in conc. of 0.75% afforded only 3.96% avoidable losses due to treatments. Results of spray treatments with 0.75% malathion aq. sprays and 0.375% sprays of tetra metyl thiram disulphide sprays though indicated 26.49% and 21.20% avoidable losses, yet can not be recommended due to various limitations like toxicity to involved species etc. These studies thus amply indicate that at grain maturity pending development of safer control methods, scaring and cultural practices like development of 'bird resistant' varieties deserve attention.

Acknowledgements

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Rafting to Tiger Tops Nepal

By

Sudhir Raghav

Nepal must be one of the most beautiful place on earth. No wonder that a person gets hooked even if he stays there for a few days.

I first went to Nepal in 1977 on a school trip. We visited the Royal Chitwan National Park and the scenic countryside surrounding Kathmandu. Since then, I had always wanted to go back. The chance came in November, 1986 when I had to go there to buy some equipment for trekking.

A friend, Mahesh Thapa, known as 'Mash' to us, is Manager of Himalayan River Exploration. It is a subsidiary of Tiger Tops.

After doing my shopping I wanted to go to Tiger Tops as soon as possible having heard so much about it. Mash was kind to arrange it for me.

We were seven in all. A British family, Johnny, his wife Jennie, their two kids Gemma and Hemish, myself, our river guide Indra Rai and his helper Biras.

We drove to a place called Kuringhat, approximately 160 km from Kathmandu. (I lost my tent here, but was lucky to get it back at the end of the trip. Mash classed me as 'most forgetful' as I would always miss out something or the other. I guess he was right.) Here we inflated our raft. It took about 45 min. with a hand and foot pump.

Starting at about 12 noon, we reached our lunch site, a sandy beach at 1.30 P.M. Having gone over some pretty good rapids. Johnny was busy with his camera and Jennie was afraid of its getting wet. I took some good photographs too.

Lunch was excellent, fried chicken and salad. After lunch, we went through some good white water. We were wearing life jackets and holding on to ropes. I was quite curious, this being my first raft trip. Gemma and Hemish once banged their heads over a rapid and started crying. After sometime, they cooled down. Kids were really lovely. I guess, it was quite exciting for them to watch Indra row hard to avoid rocks and eddys.

On the way down, I observed a lot of birds like white capped river chat, plumming red start, wall creeper, black bird whistling thrush to name a few. We were lucky to see a whole family of yellow throated Martin by the hillside, must have been about a dozen or more.

At 4.00 P.M., we came to our camp site on a sandy beach. Tents were pitched and coffee was served within no time. Here I must say that Indra Rai sure knows his job well. Besides being our river guide, he was an excellent cook and the most jovial person.

We had dinner around the camp fire. Sitting around the fire, Johnny and myself were busy locating the various stars and constellations were not very successful as our view was restricted by hills.

The second day after breakfast, we started at 9.00 A.M. It was quite cold and foggy. There were not much of white water as we had cleared the big ones on the previous day.

In calm water, I took over the Oars, its great. Like 'Ratty' said, in the childrens classic book "Wind in the Willows". There is nothing half so much worth doing as simply messing about in boats".

I saw a lot of birds, harriers, grey wagtails, red vented bulbuls, ruddy sheldrake, mergenser, lapwing, white scavanger, vulture etc.

The second day, water was calm. We stopped for lunch, food was excellent. After lunch, we crossed the confluence of Trisul and Kali Gandki, after that the river is known as Narayani. We stopped at a small town called Narayan Ghat, to buy film and beer.

At about 3.30 P.M., we reached our camping site. Here the river had widened and the sky above was lovely, full of stars, as we were in open country.

I took a few good pictures.

Second night, Johnny and myself were able to locate Cassiopeia, Ursa major, Ursa minor, Pegasus and Orior etc. We had dinner around the fire. Indra Rai showed me a fossil embedded in a rock. I took it out with a tent peg and hammer. It was ammonite fossil of the cretaceous era, it would be around 135 million years old.

On the third day, I saw a lot of wild life, as we entered the Royal Chitwar National Park. I saw lots of dug out boats made from Kepok tree. On the river bank, there were Rudyshelldrakes in huge numbers. It was a bright and sunny day, the place was like paradise to me. Never enjoyed a beer more than at that time.

We saw a few spotted Deer, the rare fish eating Gharial Crocodile, Bar headed Goose, Pintails, Cormorants, Black necked Stork, Magpie, Golden Oriole, Common Sandpiper, Red Shank, Green shank, Reef Heron, Black This Eurasian Kingfisher, Darter or snake bird, Taurny small Eagle, white scavenger Vulture, crested Hawk-eagle, common Parish Kite, Blue rock Pigeon, Pea fowl, Turtle, Spotted Dove, and the little brown Dove. Also Red Jungle Fowl, Black bellied Tern and the majestic solitory large Egret.

We had a floating lunch, cheese, veg. sandwiches, salad and luncheon meat.

After Lunch, again we saw the fish eating Gharlial crocodile and took photographs.

At 2 P.M., we dropped Johny and family at tented camp. We exchanged addresses for photographs.

Tiger Tops operates three sites in and around the Royal Chitwan National Park. Tented Camp, which is situated on Bandarjhola island, Tharu village and Tiger Tops jungle lodges. Each place is a different experience.

I was staying at Tharu village which was further down stream. It is located west of Narayani river.

Saw two more Gharial crocodiles on the way. At the place where we deflated our raft, I saw the rare Gangetic dolphin for the first time. We stayed there for two hours unloading.

The sun-set was beautiful and the dolphin was coming up to breathe after every 80/90 seconds. The site of sunset reflecting its red rays on the water and the dolphin coming out of the reflection will not fade from my memory for a long time.

I stayed at Tharu village for the night. It is made in the style of the Tharu tribe. It was a wonderful experience to dance with the tribals around the indoor camp fire.

Next morning, after a good breakfast, we crossed the river by boat, on the other side Landrovers were waiting to take us to the Tiger Tops lodge. On the way, we saw spotted deer, red jungle fowl, black necked strok and coots in a lake. The lodge is fabulous, it is double storey made of wood mostly. It stands on wooden poles about 20 ft. from the ground. There is no electricity, but solar heaters, lamps and firewood compensated for it.

I missed the morning elephant ride as I was a bit late, so I went around the elephant camp. It is one of the highlights to see the bathing and feeding of the elephants: Twelve are already there, three more are coming from India.

Rahul, one of the naturalist was giving elephant talk, the guests mostly foreigners were obviously quite curious to know everything about them.

After spending sometime at the elephant camp, I went for Nature Walk with a trekker and Indra Rai. We saw fresh spoors of Rinoceroes, but did not see any big animal, as we had gone at about 11 A.M. Different kinds of birds werer all over the place, the elegant racket tailed drongo, the vividly coloured golden backed woodpecker, red beaked treepai, small white bellied drongo and lots of flower peckers, fly-cytchers, cappersmith, quakerbabblers, and grey tits etc. We came back and had lunch. Met Johnny and family, they had seen a tiger at tented camp.

Our trekker told us that a Rinocero had been shot by Poachers, a few weeks back. I feel that both, the Nepal and Indian Govt. should direct their forest departments to tranquillize or train the Rinoceroes, elephant and remove the load-stones.

I understand that his will need a lot of hard work and some money too. But is'nt it better to have hornless Rhinos and tuskless elephants than not to have at all ? This I leave for the reader to decide.....!

Back to my story, as I had only one night in hand, I decided to spend it at tented camp. As I found it very peaceful. It's too good a place to describe in words.

On the way from the lodge to the river bank, I saw five mugger Crocodile in a lake. Also saw black necked strok, coots and fresh Tiger Pugmarks and took photographs.

We went to tented camp on a boat. The stay at tented camp was most enjoyable as it's an ideal place to observe wild life, and so quiet. There were lots of ruddy shelldrakers or brahmany ducks around camp.

The tents here are twin beded African Safari styles. Meals were served under a thatched dome overlooking the river. We sat at tables around a camp fire, food was delicious.

Next morning, I got up early and went for nature walk alone. It was very foggy. I saw a big animal more in front of me. I was ready to run. The animal went into the bushes. I think, it was a rhino, might have been two.

The only thing I was missing at tented camp was angling, which is not permitted. As it's supposed to affect the food supply of Gharial crocodiles, which is basically a fish eater.

I personally do not believe this. Of course, netting and dynamiting would certainly lessen or finish fish in any area.

Back from the walk, I had a hot bath and breakfast. From here, my return journey back to Kathmandu started. I took a boat to Tharu village, where our Van was waiting.

On the way back, we stopped at the camp sites of our raft trip. To tell the truth, I did not feel like coming back.

International Trust for Nature Conservation

Tiger Mountain is committed to conservation in the sub-continent. Recently, the International Trust for Nature Conservation (registered in U K.) was founded to support wild life conservation projects. In Nepal, current projects include the Gharial crocodile rearing project its site is near tented camp. The other is snow leopard behavioural study, which was being studied in Langu Gorge and north west of Shey Phoksundo National Park.

Tiger mountain is the marketing name of Tiger Tops mountain travel International. I am yet to see a place so well managed.

To cut the long story short, I would say Nice Place, Nice People, Nice Feelings.

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Population Ecology of Animal Parasitic Nematodes

By

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According to Boughey (1971) the initial task of population ecology is to examine the environmental forces that control the distribution, growth and reproduction of the organisms comprising the individual numbers of species population.

Phylogenetic groups of animals on their first appearance spread throughout the universe and have occupied all the possible ecological niches. In the case of animal parasitic nematodes bodies of the host, both internally and externally constitute new ecological habitats for those groups of animals that possessed the potential and capacity of adapting to them.

The biological environment inside the host provides to animal parasitic nematodes the stimuli for hatching eggs, growth of larval stages, finding of nutrition and habitat favourable for reproduction.

CLIMATIC FACTORS: For survival and development outside hosts, temperature, moisture, oxygen and in some parasitic stages food is essential. In addition, protection against harmful effects of freezing and dessication is required. In some species like *Strongylus* and *Trichostrongylus* the physical environment provides stimuli for hatching of fertilised eggs and moulting of first and second stage larvae.

Earlier studies (Tripathi, 1966, 1970) have indicated that adequate moisture in the soil to prevent dessication and to allow development, sufficient oxygen for metabolic process, shade against drying are required from the physical environment because the combination of these factors as a whole promotes development. The environment inside the body of the host safeguards the parasite against unfavourable external conditions, provides nourishment and stimuli for the development processes. Animal parasitic nematodes can survive and attain sexual maturity only when physical and physiological conditions are met at an adequate level.

LIFE CYCLES: For completion of the life cycles of parasites the physical and biological requirements are manifold. For their survival, the parasites have to encounter many adverse conditions and they have, therefore, developed a great productive potential coupled with the means of protection against natural calamities. Unfavourable weather conditions can have adverse effects on almost all aspects of population ecology of the parasites.

Thick shelled eggs, unsheathed larvae or intermediate hosts that provide protection during the period of growth and transmission are, therefore, some of the ecological adaptations of parasitic nematodes of the land animals.

Basically the life cycles of animal parasitic nematodes fall into two types.

1. *DIRECT WITH DEFINITIVE HOST*: In this case eggs are passed in the faeces of the host. Infective stages have a limited span of longivity due to adverse conditions of the various environmental features and limited food stored in its body. Transmission depends upon the availability of the definitive host to the infective stage of the parasite. Domestic animals confined to a limited area, therefore, more susceptible to infestation due to over crowding, whereas wild animals on the other hand have lesser chances of picking up infestation, as they have not to return to the same spot for quite some time during which the infective stages may have developed and died. Rate of infestation is influenced by behavioural pattern and terrestrial boundries of the host. Feeding habit also play an important role in the infestation. Animals that graze quite close to the ground acquire heavy infestation of *Trichostrongyles* whereas the animals brazing at the top of grasses are less heavily infested. Parasites with direct life cyces are generally wide spread in their geographic distribution as they can directly infest the definitive host. According to Olsen (1973) some species of nematodes like *Ostertagia* of sheep and cattle prefer cold climates whereas species of *Haemonchus* from the same host prefer warm ones.

Eggs of Strongyles, Trichostrongyles, Oxyurids and Ascarids are undeveloped when laid and depend on favourable conditions for embryonation. These eggs are externally resistant to normal environmental adversities. Embryonated eggs of Ascarids and Oxyurids hatch when swallowed by definitive host but the eggs of *Strongyles* and *Trichostrongyles* hatch in the soil where the larvae of most of the species undergo two moults and the cuticle of the second moult is retained as a protective sheath for the third or the infective stage.

Infective larvae of hookworms become active under warm conditions and their response to body heat and possibly carbon-di-oxide of the host act as stimulant for them to penetrate the skin. Infective larvae of *Trichostrongyles* migrate to grass blades in a film of moisture in dim light, thereby increasing the concentration of infective larvae for grazing animals (Tripathi, 1969).

2. *INDIRECT WITH INTERMEDIATE HOST*: In the indirect type of wildlife cycle there is a definitive host with one or more intermediate hosts.

Dracunculids and Trichinellids give birth to hatched larvae. Each has different ecological requirements for approaching the intermediate and definitive hosts. Female

dracunculids migrate to subcutaneous tissues of the definitive host, mature and extend the anterior end through the ulcer in the skin when stimulated by water and release first stage larvae through a vent in the prolapsed uterus. The active larvae in the water attract various species of *Cyclops* which eat them. Trichinellid larvae which have no free-living stage are transported by blood circulation to muscles where they encyst and grow to infective stage. Infestation normally sets in when the encysted larvae are ingested. In some species of nematodes like *Physaloptera rara* that have an indirect life cycle, an additional host is required as a transfer host.

DISPERSAL: Dispersal is involved with ecology and to some extent also connected with the food chain, as the infective stage may be the contaminent of water or in the form of larvae on forage or in the body of an intermediate host that serve as food for the definitive host. Infective stages of parasites enter their hosts either passively or actively.

Embryonated eggs and many hatched larvae such as those of Ascarids, Strongyles, Trichiostrongyles, Matastrongyles and Dracunculids enter the host passively while grazing or drinking. Larvae of hookworms, Strongyloids and Filarioides actively peneterate the epithelial covering of their hosts. After attaining the infective stage, the parasite develops further only when it enters a definitive host. Secretions like carbon-di-oxide, bile salts and certain enzymes together with the body temperature in the intestine provide stimuli to the young parasite to hatch and exsheath in order to restart the development process.

LOCALISATION OF PARASITES IN THE HOST: Parasites have their restricted sites which may be termed as ecological niches in their hosts and they reach their ecological niches by behavioural pattern. Nematodes are found in many parts of the definitive host and the sites may vary within the host according to stage of development. Adult worms of Strongyles Trichostrongyles, Oxyurids, Ascarids, Spiriurids, Trichurids and Trichinellids occupy the different parts of the alimentary canal of the host. Tetrameres are found in the proventricular crypts of birds, Metastrongylid are found in the respiratory tract and Dioctophymatids in the kidneys of mammals.

Distribution of larval nematodes in different specific sites such as haemocoel, malpighian tubules, tissues and lymph spaces and intestinal walls of both intermediate as well as final host indicate to the diverse ecological conditions to which a single species must adapt during the period of its developmental and reproductive stages. These ecological conditions comprise physiological and physical conditions and also behavioural patterns involving two or more animal hosts.

SPECIFICITY OF HOST PARASITE RELATIONSHIP: Host parasite relationship is determined in terms of the parasite to occupy and reproduce in certain

microhabitats inside or outside the body of the host, like adverse conditions in physical environment which exercise injurious effects on the eggs and free living stages of animal parasitic nematodes (Tripathi, 1969, 1974, 1977 and 1980), unfavourable conditions in physiological habitat provided by the host also have an adverse effect on their parasites. The host and the parasites adapt to each other through a selective process, since parasitism has an adverse effect on the host in the form of lowered vitality, reduced rate of reproduction, stunted growth or in heavy infestations death of the host which may some times result in extinction of the species of population or it can lead to a change in the population through the selection of the resistant species. Parasites normally exhibit preference both for the host and for habitats within the hosts. Thus parasites of horse, cattle, sheep or human beings are normally to be found in their respective hosts. In the same way parasites of the intestine, liver or tissues are found with clear regularity in these sites, thereby showing host specificity, tissue specificity or organ specificity, as the case may be.

The presence of different species of parasites in the intestine of a single host maintains the concept of ecological niches. Different parasites like ascaris and hookworms may be found simultaneously in the small intestine of the host each occupying its own niches.

IMMUNITY AS AN ECOLOGICAL FACTOR: The internal environment sometimes may be inhospitable by producing antigens that prevent it from attaining maturity (Deo and Tripathi, 1968). The antigens produced inside the host by the presence of a parasite and its metabolites change the bio-chemical characteristics of the bio-environment to such a degree that the changes may react from slight retardation in the development and reproduction to total elimination of the parasites from the host. The self cure of stomach worms (*Haemonchus contortus*) in sheep is an example.

The age of the host also changes the internal environment with the result that chances of infestation are minimised. Chicken with no mucous cells in the intestine at young stage are more susceptible to infestation by *Ascardia galli* but in aged birds in which the mucous cells are found in plenty the infestation is resisted. *Toxocara canis* develops readily in the intestine of pups but not in adult dogs.

The above discussion, therefore, points to the relationship of animal parasitic nematodes to their physical and biological environment to which the reactions of the parasitic population are very complex and still open to debate.

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Post Script to the Workshop on Conservation of Mahseer Resources of India 1986 held at Lonavala Maharashtra

The three important solutions for Mahseer Conservation that emerged out of the above workshop were:—

1. A need to improve Mahseer habitat by controlling the deteriorating environment.

2. Need for stricter enforcement of current regulations and bringing in new ones (by revising the Fisheries Act of early 20th Century) so as to effectively stop destruction of the Mahseer.

3. Creating hatcherie near Mahseer waters for regular replenishment of stock.

1. Everybody including the Govt. is aware of the problem posed by deteriorating environment and some steps of control have already been initiated but much more needs to be done very fast since the rate of damage is high and much time has been lost.

Deforestation on large scale especially in the hills has resulted in frequent droughts and excessive floods. Silt contained in flood water suffocates fish. Construction of dams and roads create further silting and pollution of waters as do addition of industrial and civic effluents. Large offtake of waters for canals reduces fish habitat. Sudden variations in water levels even to the extent of totally cutting off water in canals and rivers from headworks also causes destruction. Lack of fish ladders in dams prevents normal migration of Mahseer for reaching their natural spawning grounds. Obvious thoughts would come as solutions to these problems and they should be actioned with the help of State and Central Government facilities and funds.

2. Mahseer has suffered the onslaught of a wide section of people like Border Roadways, the Army, Border Security Force, Fishing contractors (in league with PWD, Forest and Irrigation Deptts.) and the local poachers. Methods of poaching include diversion of waters, shutting off canal waters, Electrocuting fish with high tension wires near Dams, bombing fish with explosives provided by Border Roadways/Road Construction Deptt., Army poisoning fish with insecticides/weedcides etc. from Forest Department, netting and cleaning out fish ladders with help of Irrigation Deptt. netting and bombing in Dam Reservoirs. Some or all of these methods are used in the major Mahseer Waters in Karnataka, Madhya Pradesh, Uttar Pradesh, Punjab and Haryana, Himachal Pradesh, Assam, Arunachal,

J & K etc. i.e. most of the important waters of the country. From a knowledge of the geography of these waters only can one get an idea of how vast the destruction zone is.

These poaching methods not only destroy large quantities of fish but all sections as well, from eggs to fingerlings to grown males, females spawners etc., and even their feed gets destroyed and polluted for long durations.

Focal points of poaching are river confluences, spawning grounds like tributaries or water inlets into lake and surrounding areas, stretches above and below dams, fish ladders, religious sanctuaries and big pools territory wise these form only a small area of the entire water habitat of Mahseer but if only these are watched and policed properly then it would lead to adequate conservation since generally maximum concentration of Mahseer is in such stretches.

Apart from obvious recommendations for solving aboving problems one would like to see the various Deptts. coming in close touch under one umbrella for joint action. The subject of Mahseer conservation, does not even occur to Deptts. such as PWD, Army, Border Roadways, Irrigation, forest in whose jurisdiction these fish fall and their role can make the difference between success and failure of the conservation programme. It is important therefore to involve these Deptts. in all conservation activities and to educate them on the importance of the subject. This should be done officially now.

The formation of the Angling and Conservation Association of India by Krishi Bhavan was a step in the right direction and one would like to see this Association being very active and also donating large funds for conservation. At the state level such Societies or Associations should be formed for the welfare of Mahseer and for encouraging Sport. These bodies could send their recommendation to State Government for sanction of funds on certain proposals and keep the Angling Society of India advised about day to day developments in the State. The societies could be made non-profit bodies to avoid income-tax on donations. Himachal, partly Karnataka and Maharashtra have such associations for conservation and promotion of angling however, they do not have active participation or support of the important Government deptts. and hence remain voluntary and weak bodies. It is important that these Associations are officially recognised by the State Governments and given proper status and role in conservation of Mahseer for sport and food. Unless these Associations are given authority and funds they cannot prove effective. All Mahseer states would be ready to form such associations if given a status, authority and funds. There is so far no one platform where all concerned bodies and Deptts. are represented and this could become such a platform for good co-ordination. Needless to say that directly concerned Ministries would be those of Sport, Tourism, Food and Supplies, Environment and the others indirectly. Therefore adequate funds should not be a problem.

If one puts Mahseer in the correct perspective then it would be straight realisation that this fish can sustain many a point programme on fronts like Food, Sports, Tourism Employment. The fish actually cleanses water of harmful bacteria and scavanges on waste matter like carcasses while preventing disease. It is the greatest fresh water sport fish of the world including Salmon and Anglers from all over the world come to catch it (from the ones who know about it—more publicity required. It might be mentioned here that while bigger fish exist in fresh waters like in the Nile, River huge catfish of the Burmese, Thai and Indian rivers like the Goonch etc., the Mahseer is the best sport of all as it fights hardest and tests Angling skills the most. More Indians are talking to fishing and Ministry of Sport should officially put this sport on their panel. Tourism gets a direct boost from fishing. Food potential is vast if the fish is conserved as per above recommendations. In fact, the incentive to poaching will become much less if the fish is made plentifully available. The fish contractors would get their fair catch and put it in the market at reasonable prices for mass public consumption.

Above all, the entire environment of the area would improve to benefit all including humans.

It is recommended that State Angling Associations lease out certain stretches of good waters for promotion of the Angling sport. Other zones can be demarcated for operations of the fishing contractors. The balance well chosen areas should be made completely protected waters like sanctuaries.

Much importance has been given to the Tiger and special funds and areas earmarked for its conservation and proliferation. Most people seem to have forgotten about the Tiger underwater which is the Mahseer. Unfortunately lack of interest by the various Deptts. so far has even dampened the spirits of the most avid conservationists and Anglers.

3. The subject of creating new hatcheries for controlled breeding of Mahseer in Mahseer states was discussed at the workshop and it was agreed upon that all concerned would set up hatcheries with the help of seed from Tata Electric Hatchery or local waters. Hatchery fingerlings could replenish depleted natural water resources. But unless the natural waters are protected this scheme would not be useful.

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Some of the Problems of Management of Dudhwa National Park

By

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Zoological Survey of India, Dehra Dun

Introduction

Being a renewable resource, the wild life and forest products were considered inexhaustible around the turn of the present century but with the passage of time, this age-old belief has gradually lost its credibility. In recent years, the fast annihilation of forests and wild life has compelled every right thinking person of this country to adopt drastic measures to save the fast depletion of this national wealth and ensure the continuance of our floral and faunal heritage. The Indian wild life has not only attracted the naturalists but has always fascinated the common man, but during the past, also some unscrupulous wealthy snobs took to the killing these animals for some wild pleasure and excitement and destroyed them and their natural habitat.

In recent years, there has been a gradual and constant advancement in the growth of awareness in the field of natural resource conservation. The earlier belief that the wild life was only a product of the land as good as agriculture and minerals but the fast depredation of this product has forced the environmentalists and conservationists to the changing concepts such as habitat management, carrying capacity and sustained yield (Singh, 1982). The shift in the concept of wild life management has been witnessed in the post-independent era when it was realised that no species could live of its own. In fact, every species is an integral part of a well knit ecosystem and the breaking up of ecological web at any level could jeopardise the existence of even mankind.

In India, serious efforts to preserve and propagate the wild life started as early as 1951 when the Indian Board for Wild Life was constituted under the chairmanship of the then Prime Minister, late Pandit Jawahar Lal Nehru. Since then, many new Sanctuaries and National Parks have been established and the areas of many old National Parks and Sanctuaries have been increased. To be in line with the National Policy, the Government of Uttar Pradesh has established among others, the Dudhwa National Park in the year 1968, because of its unique habitat harbouring among others the magnificent soft ground Barasingha, *Cervus duvauceli duvauceli* Cuvier. This animal faced a constant pressure for its very survival on the swampy patches which were fast diminishing due to conversion of

swampy land into agricultural fields, especially for the production of sugarcane in the Terai region of Uttar Pradesh. The pace of conversion of these swampy patches into the crop fields has accelerated after the resettlement of refugees from Bangladesh and acquisition of large patches by affluent Sikh migrants from Punjab.

The authors have surveyed the Dudhwa National Park in December, 1983 with a view to studying its fauna and for making an assessment of the possibility of future scientific research in the field of wild life management.

DUDHWA NATIONAL PARK

The Dudhwa National Park is situated in the catchment area of river Sharda in Lakhimpur Kheri district, bordering Nepal in the Uttar Pradesh Terai. The Park was established in 1960 with an area of 612 km^2 including 123 km^2 buffer zone under Uttar Pradesh National Park Act. Geographically, the park lies between Lat. 28° 21′ and 28° 42′ N. and Long. 80°31′ and 80° 56′ E. (Directory of National Parks and Sanctuaries in India, 1985).

Topographically, the area is dotted with swampy and forested patches. The forest constitutes mainly the Sal trees. The Sal forest zones occupying an estimated 80% of the total Park area and the remaining are the wetland areas including grassland, lakes, ponds and rivers. The ecological conditions of both the zones are entirely different from each other, with predominantly hard soil in the forested zone and the swampy conditions in the grassland and wetland areas (Tilak and Sinha, 1983-84).

Singh (1973) has given the natural history of Dudhwa National Park. The park is in the catchment area of river Sharda, a tributary of river Ghagra which ultimately joins the river Ganga. The area is drained by Suheli river, Latkanwa nala, Noraha nala and Joraha nala. Kakraha taal, Tiger taal and Nardaha taal are the three perennial tanks present in the area.

The Park has been known for its rich wild life for many centuries even when it was not declared as a National Park. The area is comparatively less disturbed and hence protected. It also forms a resting place for many migratory animals. Of the large mammals, the Wild Boar, the Spotted Deer, the Hog Deer, the Swamp Deer, the Sambar, the Blackbuck, the Nilgai etc. are the major hoofed animals which inhabit the Park and exploit the transient flora. Tiger is the only most important predator in the Park. Because of the special configuration of wild life and forest in the Park, it provides ample scope for study of inter-relationships between species in the right perspective.

The human population explosion has brought cultivation right up to the edge of the forest and this has led to the increasing incidences of encounters of the human interests with

the wild life. The protection oriented management has resulted in the increase of population of carnivores especially the tiger. The improvement in habitat management has not been adequate to the extent that it can provide the required prey species to these carnivores. The extension of cultivation up to the periphery of the forest has lured these carnivores to make easy prey of the livestock and thus turned them into man-eaters. So far, 82 persons have fallen prey to the man-eating tigers around Dudhwa National Park during recent years. Singh (1982) has narrated an incident in which the villagers residing around Dudhwa National Park were extremely annoyed by the plunder of human life created by man-eating tigers and the slogan of Wild Life Authorities to save tiger to increase it population. In exchange of human life destroyed by man-eating tigers, the Wild Life Authorities offered monetary compensation to the surviving members of the victims' families Infuriated at this inequitable compensation, the villagers threatened to tie up the Wild Life Warden as a bait and offered to pay compensation to his family after he was killed by the man-eating tiger. The expression of anger by the villagers narrated above should help us to modify our policies for a balanced management so that the population of carnivores is kept at a manageable level so that it is directly related to the available herbivore population.

The menace of tigers turning to man-eating and cattle-lifting has to be curbed for creating a sense of confidence among common people especially residing around the wild life areas. It is then alone that the policy of protection of wild life can be successful. It is difficult to expect a culture of conservation consciousness among the masses when their only movable property i.e. cattle on which their livelihood is based, is destroyed and sometimes the only earning member of the family is killed, putting the whole family into a tremendous hardship.

The other burning problem, faced by the management of Dudhwa National Park is the infestation of dacoits. Being in the Terai region and at the International Boundary, the park's forest area has become a safe abode for the dacoits to hide and operate. These areas are neglected for developmental activities because of the general backwardness, inaccessibility together with unhygienic conditions, excess of mosquitoes etc.; the human population in the area is also sparse. The northern part of the Park forms a common International Boundary with Nepal. There is no restriction in crossing over the International Boundary. This has been a major attraction for the dacoits to harbour within this area. In case of a pressure from the forest authorities or the police, these dacoits simply cross over the International Boundary and escape.

The presence of dacoits and man-eaters in the area have considerably hampered the implementation of management practices and serious scientific research in Dudhwa National Park. The time has come when we have to make a determined effort to curb the menace of dacoits and man-eaters once for all. Man-eaters may be controlled by catching the known

offenders either by trapping or by tranquilising and transferring them to some Zoos. The buffer zone should be strengthened so that the chance of sharing the common areas by the human beings and their cattle with the wild life is minimised and thereby reduce the lure-ment of the tiger towards them. As mentioned earlier in this connection, the management of forests and wild life should be balanced in such a way that the population of tiger is directly proportional to that of the available prey species and if there is any disproportional increase in the predator population, they should be captured and shifted to the other areas and Zoos.

DUDHWA NATIONAL PARK AS BIOSPHERE RESERVE

Human population is very low in the Park and therefore, the intervention of man is extremely low. For this reason, the fauna and flora of this Park is to a great extent safe. The human interference in disturbing the ecology of the area is further reduced because of the menace of man-eating tigers and presence of dacoits. Considering these special circumstances prevailing in the area, the Government of India thought this as one of the key areas for preservation of the gene-pool biota existing in the Park and hence named it as one of the Biosphere Reserves. From a scientific angle, the survey and study of the biota to be preserved within the precincts of the reserve is required to be studied in detail and thorough knowledge of the same should help the Wild Life Authorities for preservation and better management of the various biotypes existing in the area.

In view of the above statements, a thorough survey and study of the fauna for the sake of preparation of an inventory of the important animal types and various aspects of the relationship of their ecological conditions should be very important. Any further study in this area should be welcome step to procure and utilise the scientific knowledge for better management and preservation of the gene-pool of the important faunal elements.

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वन्यप्राणी संरक्षण : समस्या और संभावनाएँ

जी०डी० द्विवेदी
अधीक्षक, पेंच अभयारण्य सिवनी, मुख्यालय—कुरई, सिवनी (म०प्र०)-480 880

वनस्पति और प्राणी जगत के आश्चर्यों तथा रहस्यों से परिपूर्ण हमारे देश की वन सम्पदा प्रकृति की दुर्लभ देन है। इस विशाल देश की वनस्पति में उतनी ही विविधता है जितनी कि यहाँ की जलवायु और मिट्टी में। एक ओर हिमाच्छादित हिमालय की उत्तुंग धवल चोटियाँ तो दूसरी ओर अनन्त जलराशि युक्त लहराता महासागर, एक ओर सौराष्ट्र-राजस्थान की सूखी मरुभूमि तो दूसरी ओर शस्य-श्यामल पूरित आसाम-बंगाल की हरित भूमि। जलवायु और वनस्पति की इस विविधता का प्रभाव प्राणी जगत पर भी पड़ा है।

अनुमान किया जाता है कि धरती पर पाई जाने वाली सम्पूर्ण ज्ञात वनस्पति व जीव प्रजातियों का लगभग 4 से 5% भाग हमारे देश में उपलब्ध है। यहा लगभग 15000 प्रकार की वनस्पतियां, 50000 कीड़े, मकोड़े, 6500 अपृवंशीय अन्य प्रजाति के जीव-जन्तु, 1200 प्रजाति के पक्षी (किस्मों को मिलाकर 2100), 345 स्तनपायी तथा अनेक प्रकार के मत्स्य, सरीसृप, उभयचर आदि सभी प्रकार के जीवों को मिलाने से लगभग 65000 जीव-प्रजातियां भारत में पाई जाती हैं।

भारतीय संस्कृति के आधार वेद, पुराण आदि सम्पूर्ण प्राचीन वाङमय, मनुष्य व पशु-पक्षियों के सहअस्तित्वपूर्ण क्रियाकलापों की मनोहारी गाथाओं से ओत-प्रोत हैं। देवताओं के वाहन के रूप में पशु-पक्षियों का उपयोग, पंच तंत्र, हितोपदेश आदि संस्कृत ग्रंथों में पशु-पक्षियों के माध्यम से उत्कृष्ट उपदेशों और नीति वचनों की ज्ञान-सरिता का प्रवाह, वस्तुतः भारतीय संस्कृति की अनुपम उपलब्धियाँ हैं। हड़प्पा-मोहनजोदड़ो की खुदाई से प्राप्त पुरातत्वीय अवशेषों में पशु-पक्षियों के चित्रण के यथेष्ठ प्रमाण उपलब्ध हुए हैं। कहने का तात्पर्य यह है कि भारत में पशु-पक्षियों के प्रति उत्कृट प्रेम और उन्हें संरक्षित करने की परम्परा अति प्राचीन और विश्व में सर्वथा अग्रणी है।

विदेशी आक्रमण, संस्कृति के अपमिश्रण शौर बढ़ते मानवीय स्वार्थों के कारण पशु-पक्षियों के प्रति इस उदात्त प्रेम भावना का ह्रास आरम्भ हुआ। आवश्यकता की विवशता नहीं अपितु मनोरंजनार्थ इनका आखेट प्रारंभ हुआ। वन्य-जीवों का आखेट शासकों, राजाओं या समाज के विशिष्ट लोगों के लिए शौर्य और सम्मान का प्रतीक वन गया। मुगलकाल के अधिकांश बादशाह अच्छे शिकारी हुए किन्तु उस समय तक शिकार केवल तीर-धनुष, तलवार, भाला, बरछी तक सीमित था अतः वन्य प्राणियों की संख्या में विशेष कमी नहीं आई। फिर वैज्ञानिक युग का सूत्र-पात हुआ। नई बन्दूकों, राइफलों, भयंकर कारतूसों, स्वचालित तीव्र वाहनों के आविष्कार ने शिकार को और भी सुलभ तथा

अपरिमित कर दिया। इसी काल में वन्य प्राणियों का सर्वाधिक विनाश हुआ। शेर तथा अन्य बड़े आखेटीय वन्य पशुओं के हुए संहार का अनुमान लगाने के लिए यहाँ कुछ आँकड़े दिए जा रहे हैं:—

(अ) वर्ष 1800 ई० से 1940 ई० के बीच

जार्ज उदनीयल (बंगाल)	400
कर्नल राइस (नीमच)	93
–,,– नाइटिंगेल	300
महाराजा नेपाल	295
–,,– रीवा	636
–,,– नृपेन्द्र नारायण (कूच बिहार)	370

और –,,– सरगुजा ने कुल 1707 शेरों का शिकार किया !!!

(ब) कूच विहार के संगठित आखेटों (1871 से 1907) में 208 गेंडा, 430 जंगली भैंसे, 324 बारासिंघा मारे जाने का उल्लेख मिलता है।

(स) इसी प्रकार 1907 से 1919 के बीच काश्मीर के शिकारी द्वारा 58613 जंगली मुर्गियों तथा 1938 में धाना पक्षी अभयारण्य (वर्तमान केवलादेव-धाना पक्षी राष्ट्रीय उद्यान, भरतपुर, राजस्थान) में वाइसराय लार्ड लिनलिथगो के द्वारा 4273 (डक्स, गीज) बतखें मारने का अभिलेख मिलता है।

प्रत्यक्ष शिकार के अतिरिक्त भी और कई ऐसे कारण हैं जिनकी वजह से वन्य प्राणियों की संख्या में शोचनीय कमी आई है।

मनुष्य की बढ़ती हुई आवादी और गुणितानुपात में बढ़ती हुई कृषि व वसाहट हेतु भूमि की माँगों ने वन्य प्राणियों के प्राकृतिक आवास को निरन्तर सिकोड़ने का प्रयास किया है। वन तथा वनों के आस-पास का ऐसा क्षेत्र जो कृषि कार्य के सर्वथा अनुपयुक्त था—जोत के अन्दर मिला लिया गया, भू-संरक्षण के सिद्धाँतों की अवहेलना हुई, ग्रामीण चरागाहों को भी खेती-बाड़ी में परिणित कर दिया गया और पालतू मवेशियों को चरने-चराने के लिए प्रतिवन्धित क्षेत्रों (आरक्षित वन—वन्य प्राणियों के प्राकृतिक वास स्थल आदि) में घुसेड़ा जाने लगा।

ईमारती लकड़ी, जलाऊ लकड़ी, निस्तार सम्वन्धी अन्य वनोपज, तेन्दूपत्ता, गोंद, फल-फूल आदि के दोहन-प्रक्रियाओं का भी असर वन्यप्राणी आबास स्थलों पर पड़ा। इसी प्रकार सिंचाई योजना, विद्युत उत्पादन तथा संचार, नये मार्गों का निर्माण, विस्थापितों की वसाहट आदि कारक भी आवास-स्थलों में कमी लाने के लिए जिम्मेदार हुए। इस प्रकार हम देखते हैं कि वनों की अवैध कटाई, चराई, आग, अवैध शिकार आदि के रूप में मानवीय हस्तक्षेपों ने निरीह वन्यप्राणियों के

जीवन-संग्राम को और भी जटिल वना दिया है । इस संधर्ष में कई वन्य-जीव प्रजातियाँ विलुप्त हो चुकी हैं तथा कई अन्य लुप्त होने के कगार पर पहुँच गई हैं । शिकारी चीता (Hunting leopard), ललासिरी वतख (Pink headed duck), जर्डन्स कोर्सर पहले ही विलुप्त हो चुकी हैं ।

वन्य प्राणी संरक्षण अधिनियम (1972) में अनुसूची । में दुर्लभ तथा संकटग्रस्त वन्य-जीवों की सूची दर्शाई गई है । जिसके अनुसार 70 स्तनपायी, 22 सरीसृप व उभयचर तथा 41 पक्षी-प्रजातियाँ को सम्पूर्ण भारत में सुरक्षित घोषित किया गया है । अपृष्ठवाँक्षियों को मिलाकर आजकल इस अनुसूची में कुल 523 प्रजातियाँ (उप जातियों को मिलाकर) सम्मिलित की जा चुकी हैं ।

सिंह, शेर, चीता, बर्फानी चीता, भेड़िया, सियार, स्याहगोश आदि माँस भोजी वन्य जीव, गैंडा, हाथी, संघाई, हांगुल, बारासिंघा, कस्तूरी मृग, जंगली भैंस, कालाहिरण, चिंक, चौसिंघा, हिमालय का थार, नीलगिरी का थार, कई प्रकार के वन्दर, चील, याक आदि जीव भी संकट के कगार पर आ चुके हैं ।

आवास स्थलों के विनाश तथा वायु एवम् जल के प्रदूषण ने भारत के विविध पक्षी समुदायों को हानि पहुँचाई है । इन्डियन स्किमर जो अनेक नदियों में पाई जाती थी अव दुर्लभ हो गई है । साइबेरियाई क्रेन जो शीत ऋतु में भारत आते हैं—1972 में उनकी संख्या 77 थी किन्तु वर्ष 1983 में भरतपुर की झीलों (केवलादेव घाना रा०उ०-भरतपुर राजस्थान) में केवल 36 साइबेरियाई क्रेन गिने जा सके । सोहन चिड़िया के अधिकांश आवास स्थल नष्ट हो चुके हैं ।

बहु आयामी समस्या का स्वरूप:—

वनों के अति दोहन के फलस्वरूप, आवास स्थलों में कमो आई जिसका स्पष्ट प्रभाव वन्य प्राणियों की संख्या व उनकी समुदाय-संरचना पर परिलक्षित होता है । वन्य-प्राणियों के विनाश का प्रभाव केवल उन्हीं तक सीमित नहीं रहता वल्कि उसका प्रत्यक्ष या अप्रत्यक्ष प्रभाव हमारे ऊपर भी पड़ता है । जीवन के सभी रूप चाहे वह मनुष्य हो, अन्य जीवधारी हो अथवा पेड़-पौधे हों सभी एक-दूसरे से परिस्थितिकीय सूत्रों द्वारा इस प्रकार सुसम्वद्ध हैं कि किसी एक को छेड़ने से दूसरों का सन्तुलन विगड़ जाता है । यदि पेड़-पौधों या जीवों की प्रजातियों का ह्रास होता है, वे विलुप्त होती हैं अथवा संकटापन्न स्थिति में पहुँचती हैं, तो यह निश्चित रूप से पर्यावरण के ह्रास या प्रदूषित अवस्था की सूचक होती हैं । पर्यावरण का यह ह्रास, असन्तुलन अथवा प्रदूषण निश्चित रूप से "मनुष्य" को प्रभावित किए विना नहीं रहता । उसका स्वयं का अस्तित्व ही खतरे में पड़ सकता है । प्राकृतिक अवस्था में निम्न-2 इकोतंत्रीय ईकाइयों में रहने वाले जीव-जन्तु व पेड़ पौधे एक निश्चित खाद्य-शृंखला एवम् खाद्य-जाल से जुड़े होते हैं । प्रत्येक स्वतंत्र इकोतंत्र स्वयं पोषण तथा स्वयं-नियंत्रण की क्षमता रखता है । किन्तु मनुष्य द्वारा इन प्राकृतिक क्रिया विधियों को कृत्रिम क्रियाओं द्वारा प्रतिस्थापन अथवा छेड़-छाड़ करने से यह सन्तुलन बिगड़ जाता है ।

पौधे तथा अन्य जीव-धारी मिलकर ही संसार के जीवित संसाधनों का निर्माण करते हैं। खाद्य-श्रृंखलायें तथा विभिन्न चक्र, जीवन, धारण प्रणाली के आवश्यक उपकरण हैं जो जीवों (जिसमें मनुष्य भी सम्मिलित हैं) के अस्तित्व के लिए परमावश्यक हैं। अत: प्रकृति के इन चक्रों को छेड़ने का मतलब अपने पैरों कुल्हाड़ी मारना है। प्रकृति के साथ की गई छेड़-छाड़ का दुष्परिणाम हमें भयंकर बाढ़, सूखा भूस्खलन, सिंचाई बाँधों का भराव आदि के रूप में भुगतना पड़ रहा है। गत 10-12 वर्षों में बाढ़-पीड़ित क्षेत्रों में लगभग दो गुनी वृद्धि हो गई। 2 करोड़ हेक्टर से बढ़कर लगभग 4 करोड़ हेक्टर क्षेत्र बाढ़ ग्रस्त होने लगा है। बाढ़ से अरबों रुपये की क्षति होने लगी है। दूसरी ओर देश की बढ़ती हुई जनसंख्या, कृषि योग्य भूमि की कमी, विकासशील देश की सर्वाङ्गीण प्रगति हेतु नये उद्योगों की स्थापना, सिंचाई योजना, विद्युत तापघर, संचार प्रणाली का विकास, गरीबी समस्या से जूझने के लिए लघु या कुटीर उद्योग प्रणाली का विकास, विस्थापितों की बसाहट आदि अनेक राष्ट्रीय मुद्दे हैं जिनका प्रत्यक्ष या परोक्ष सम्बन्ध वन भूमि (आवास स्थल) तथा वन्य प्राणियों से जुड़ा हुआ मिलता है। सामाजिक, आर्थिक विषमताओं की इस सांस्कृष्ट संरचना की गुत्थी को सुलझाना, और देश के प्राकृतिक वातावरण-पर्यावरण के सन्तुलन को बनाए रखने हेतु वन तथा वन्य प्राणी संरक्षण के कार्यों को गति प्रदान करना नि:संदेह एक चुनौती भरा काम है।

संरक्षण कार्यों के प्रभावी क्रियान्वयन हेतु मार्ग दर्शक सिद्धांत: —

वन, वन्य प्राणी तथा वनों के आस-पास निवास करने वाली आदिवासी जन-जातियां अथवा ग्रामीण-समुदाय, सभी एक दूसरे से भिन्न-भिन्न परिस्थितिकीय सामाजिक-आर्थिक विवशताओं से जुड़े हुए हैं। वनों और वन्य प्राणियों के संरक्षण हेतु हमें जन-जातियों और ग्रामीण समुदायों का सक्रिय सहयोग लेना आवश्यक है। विकास-कार्यों के लिए साथ-साथ योजनायें बनानी होंगी। जन-विद्रोह की स्थिति का निर्माण हो जाने पर वन्य प्राणी संरक्षण कार्य कभी भी सफल नहीं हो सकता। अस्तु प्रभावी क्रियान्वयन हेतु निम्नानुसार कदम उठाया जाना श्रेयस्कर प्रतीत होता है :—

(1) ईकोतंत्रीय सिद्धांतों पर आधारित सरंक्षण कार्यों की रूप रेखा तैयार करना, जहाँ मानवीय हस्तक्षेपों के कारण आवास-स्थलों का विनाश हुआ है। उन क्षेत्रों को पूर्णतया सुरक्षित करते हुए पुनर्स्थापित होने के अवसर देना।

(2) भारत में अनेक प्रकार के वन-वनस्पति समूह मौजदू हैं जो प्रवन्ध की दृष्टि से अलग-अलग ईकाइयों के रूप में व्यवस्थित किए जा सकते हैं—हिमालयीन क्षेत्र, तराई क्षेत्र, मध्यवर्ती भारत के समतल मैदानी भाग, पूर्वी तथा पश्चिमी घाट, समुद्र तटोय वन प्रदेश, रेगिस्तानी भाग आदि। यह उचित होगा कि इन जीव-भौगोलिक क्षेत्रों को उपयुक्त प्रतिनिधि ईकाइयों में बिभक्त कर प्रवन्ध योजनाएं तैयार की जायें तथा सुरक्षात्मक प्रविधियाँ लागू की जायें।

(3) वन्य प्राणी संरक्षण के लिए चुने गये आरक्षित वनों में "हृदय क्षत्र" (Core Area) निर्मित किये जायें, जहाँ किसी प्रकार की कटाई, चराई या अन्य हस्तक्षेप न होने दिए जायें। इस क्षेत्र के चारों ओर वफर क्षेत्र का होना आवश्यक होगा अन्यथा इनका निर्माण प्रभावकारी सिद्ध नहीं होगा। ईंधन, चराई या घास आदि की निस्तार सम्बन्धी आवश्यकताओं की पूर्ति के लिए वफर क्षेत्र से व्यवस्था करनी होगी और इकोतंत्रीय प्रबन्ध में ग्राम समुदायों को सम्मिलित करना होगा।

(4) वनों के आस-पास रहने वाले लोग मुख्यत: कृषि व पशुपालन पर निर्भर रहते हैं अत: सामुदायिक विकास योजनाओं में इन दोनों व्यवसायों की उन्नति के लिए समुचित प्रावधान आवश्यक है।

वन्य प्राणी क्षेत्रों का प्रबन्ध चाहे कितना ही वैज्ञानिक हो, सुरक्षा कितनी भी कड़ी हो, यदि क्षेत्र परिस्थितिकीय दृष्टि से पर्याप्त नहीं है तो आगे चलकर संरक्षण कार्यों के अभीष्ट लक्ष्यों की प्राप्ति असंभव होगी। अत: जहां एक ओर वन्य प्राणी संरक्षण की ईकाइयाँ इकोलाजिकली पर्याप्त विस्तार की होनी चाहिए वहीं दूसरी ओर उनके आस-पास वन भूमि का ऐसा पर्याप्त अन्य क्षेत्र भी होना चाहिए जो ईमारती, ईन्धन, चराई आदि की आवश्यकता-पूर्ति के लिए प्रयुक्त किया जा सके तथा भविष्य में वन्य प्राणियों के क्षेत्र विस्तार के भी काम आ सके।

(5) वन्य प्राणी संरक्षण कार्यों के प्रति जन-मानस को तैयार करना बहुत आवश्यक है। इसमें सभी वर्ग के लोग सम्मिलित किए जाने चाहिएं—राजनैतिक, प्रशासक, व्यावसायिक, युवा, शहरी तथा ग्रामीण सभी। विशेषकर छात्र समूहों को वन्य प्राणी संरक्षक के महत्व को समझते हुए इस कार्य के प्रति उनमें प्रेम और निष्ठा के भाव जागृत करना भविष्य के लिए अत्याधिक लाभदायक सिद्ध होगा।

(6) जहाँ आरक्षित वनों से गाँवों को विस्थापित करना आवश्यक हो उनके बसाहट व अन्य सुविधाओं का विकास पहले कर लेना उपयुक्त होगा। कृषि के लिए तैयार खेत, चरागाह, पेयजल, शिक्षा, चिकित्सा आदि सुविधाओं के साथ गृह निर्माण की व्यवस्था करने के बाद ही उन्हें हटाने का प्रयास उचित समझा जा सकता है। और तभी उनका सहयोग भी प्राप्त किया जा सकता है। अन्यथा स्थिति समस्याजनक बनी रहेगी।

(7) बड़े सिंचाई बाँधों या अन्य उद्योगों की स्थापना के क्षेत्र, वन्य प्राणी क्षेत्रों से दूर रखने होंगे। क्योंकि निर्माण की तैयारी, निर्माण कार्य व निर्माण के बाद तीनों ही अवस्थाओं में इनका असर वन्य प्राणी व उनके आवास पर प्रतिकूल ही पड़ता है।

(8) वन्य प्राणी बहुल क्षेत्रों के आस-पास रहने वाले ग्रामीणों को अनेक प्रकार के वैधानिक प्रतिबन्धों के साथ-साथ अन्य समस्याओं (जैसे वन्य पशुओं द्वारा फसल को क्षति, हिंसक जानवरों

द्वारा पालतू मवेशियों को मारा जाना, जनहानि के प्रकरण आदि) का भी सामना करना पड़ता है अत: फसल क्षति, मवेशी क्षति एवम् जनहानि के प्रकरणों में त्वरित कार्यवाही करते हुए समुचित मुआवजे का यथाशीघ्र भुगतान आवश्यक है । यदि कोई हिंसक जीव जन-धन के लिए खतरनाक हो जाता है (नरभक्षी) तो उसे नष्ट कराने की त्वरित कार्यवाही में विलम्ब नहीं करना चाहिए ।

(9) वन्यप्राणी सुरक्षित क्षत्रों को "परिस्थितिकीय विकास हेतु विशेष क्षेत्र" (Special area for Eco-development) के रूप में मान्यता प्रदान की जानी चाहिए तथा इनके प्रबन्ध और वन्य प्राणी संरक्षण तथा सामुदायिक विकास के कार्य साथ-साथ चलाना चाहिए । इस प्रयोग के लिए पहले कुछ अभयारण्यों व राष्ट्रीय उद्यानों का चयन किया जा सकता है । योजनाबद्ध तरीके से कार्य करने के बाद प्राप्त सफलता के आधार पर क्रमश: अन्य क्षेत्रों को भी सम्मिलित किया जा सकता है ।

(10) स्थानीय लोगों को (इन क्षेत्रों में कराये जाने वाले समस्त कार्यों में) रोजगार के लिए प्राथमिकता निर्धारित की जानी चाहिए । हस्त-शिल्प व अन्य स्थानीय कलाओं को प्रोत्साहन दिलाते हुए उनके विक्रय की व्यवस्था कराई जा सकती है ।

(11) ईको-विकास, वन्यप्राणी संरक्षण सम्बन्धी अन्य समस्यायें, सामाजिक-आर्थिक पहलु तथा सामाजिक न्याय पर आधारित विविध विषयों पर अनुसंधान कार्य किया जाना चाहिए । इनसे समस्याओं के वैज्ञानिक समाधान में सहायता मिलेगी ।

(12) सभी स्तर के छात्रों, शिक्षकों व अन्य संस्थाओं को वन्य प्राणी संरक्षण के महत्व, आवश्यकता, आदि की वैज्ञानिक जानकरी दिलाने के लिए योजनाबद्ध कार्यक्रम बनाए जाने चाहिएं । "प्रकृति-मंडल" नेचर क्लब, वन्यप्राणी-प्रेमी मंडल, "बर्ड-वाचर्स ग्रुप" सोसायटी आदि नई स्वयं सेवी संस्थाओं की स्थापना और विकास को प्रोत्साहन मिलना चाहिए । समाचार-पत्र, पत्रिकायें, आकाशवाणी, दूरदर्शन, फिल्म डिवीजन सभी का सहयोग लेते हुए प्रचार-प्रसार का कार्य पूरे देश में किया जाना चाहिए ।

(13) वन्य प्राणी पर्यटन का विकास पर्यटन, वन तथा वन्य प्राणी शाखा के संयुक्त माध्यम से विकसित किया जाना चाहिए । क्षेत्र की उपयुक्तता, धारणक्षमता, स्थानीय कठिनाइयाँ तथा कार्यकर्ताओं की उपलब्धता के अनुरूप ये कार्यक्रम बनाने होंगे ।

वन, वन्य-प्राणी तथा अन्य जीवित संसाधनों का संरक्षण आज की अपरिहार्य आवश्यकता है । इनका संरक्षण न केवल राष्ट्र के भविष्य लिए के अपितु मानव जाति के अस्तित्व के लिए भी परमावश्यक है ।

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Book Review

Conserving India's Natural Heritage by Samar Singh

Publisher—Natraj Publishers, Dehra Dun; Price Rs. 150/-

Of the enviable national heritage of India, Wildlife (flora and fauna) is the most valuable not only for making human life more enjoyable and interesting but for the very survival of the human race. Realisation of this resulted in the formation of several organisations of the international level about the middle of this century and the Indian Board for Wildlife in 1952. The 1972 Stockholm United Nations Conference on Human Environment was the beginning of a series of quick appraisals and formulation of action plans throughout the world. The fact that the Indian Prime Minister, Indira Gandhi delivered the inspiring key note address to the conference made it of special significance to the Indian Conservation movement. The following years saw the initiation of many steps in this direction in the Indian scene.

The crucial period in the history of wildlife conservation in India has been the half decade from 1980 as several initiations took practical shape in this period. As Joint Secretary in the Government of India dealing with the subject, the author was personally involved in pushing them ahead. No one could, therefore, be better suited and equipped than him for chronicling the various actions and knitting them together into a fascinating story.

The book starts with the World Charter for Nature adopted by the United Nations in 1982 and passes on to a general treatise on why conserve wildlife, a question that always confronts a beginner on wildlife. It then passes on to the connected legislations in India and to the forest management strategy as these form the very bases for any conservation programme. The National Wildlife Plan for Conservation and Management of the great biological diversity in the country, launched in 1983 follow along with discussion on the operative parts. Protected areas in India, Biosphere Reserves, prestigious Project Tiger, and Rhino re-introduction are the well considered initiatives taken towards conservation of special areas and species. The datails of the programmes have been lucidly given and discussed.

Addition of the Corbett Action Plan for the protected areas of the Indo-Malayan Realm developed by the representatives of the concerned countries of the region in February 1985 has been a very useful plan. This is the first effort to work out a plan, exposing the problems and suggesting measures to overcome them jointly for the South and South-Eastern region of Asia. Wildlife knows no political boundaries and hence a joint effort was called for in case of this valuable natural resource. A chapter on cites and India discusses the problems confronted due to trade in endangered species of wild fauna and flora and efforts made to solve these at the international level. These finally lead to rational conservation.

The presentation is lucid and factual. Good quality photographs add to the attraction. Author's intimate personal involvement in the various programmes gives a high sense of credibility to recommendations. The text is highly readable and forms a well connected history of wildlife conservation in India during the Seventies and the first half of eighties. The get-up of the book is good and price reasonable. It is a must for public and private libraries of institutions and persons interested and involved in wildlife conservation.

N.D. Bachkheti

Uttar Pradesh's
GRAND ATTRACTION

For Lovers of Wild Life

CORBETT NATIONAL PARK
DUDWA NATIONAL PARK
VALLEY OF FLOWERS NATIONAL PARK

CORBETT NATIONAL PARK is famous all over the world for its scenic grandeur and its wildlife—elephants, tigers, deer (several species) and a host of other mammals, birds and reptiles—the Ghariyal and magar and the mighty "Mahasheer fish".

DUDWA NATIONAL PARK is famous for its biggest surviving herd of 2600 swamp deer besides Tiger, Spotted deer, Sambhar, Hogdeer, Barking deer, Sloth bear, Wild boar, Marsh Crocodile and hundreds of innumerable birds. It is also now a home of Great Indian One Horned Rhinoceros introduced recently.

VALLEY OF FLOWERS NATIONAL PARK is an alpine valley nestling in shadow of snow peaks full of lush vegetation during monsoon. The valley remains in bloom for three months. The important vegetation consists of Rhodendrons, Primulas, Potentillas, Saxifrages, Marigold etc.

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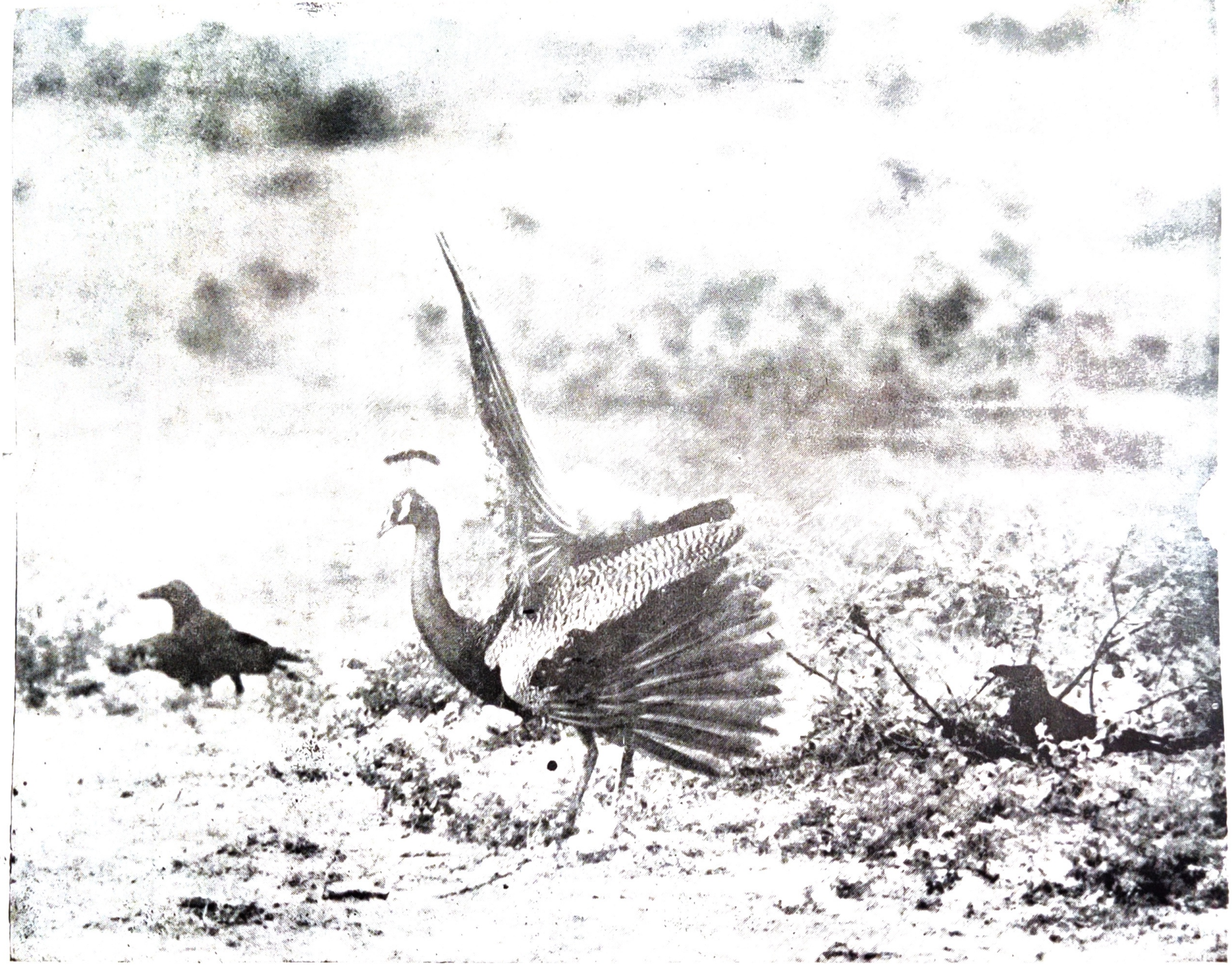

Peacock

Photo—Joanna Van Gruison